

# The AUTOMOBILE

## Reasons for the Twelve

Valuable Discussion on Engineering Principles Brought Out by J. G. Vincent's Paper Read Before the Detroit Section of the S. A. E.

**Q**UESTIONS of balance, vibration, displacement per foot of travel, and carburetion were the high spots brought out in the discussion which followed the presentation of the paper by J. G. Vincent, vice-president in charge of engineering of the Packard Motor Car Co., Detroit, Mich., on the twin six motor. Last week a large part of this paper was published in *THE AUTOMOBILE* and this week appear the remaining portions of the paper together with the diagrams and the discussion which followed. Mr. Vincent's remarks follow in part:

### Unbalanced Forces Due to Inertia

In my report to Mr. Joy, I referred to the unbalanced forces due to inertia in a four or twin four motor, and explained that these forces were cancelled out in a properly designed single six or twin six motor. I believe that these forces are thoroughly understood by engineers generally, but I have thought it best to go into the matter briefly in this paper in order to make it more complete.

Fig. 1 shows a partial cross-section of a twin four motor of 3 7/16 in. bore by 5 1/4 in. stroke, or a total piston displacement for the motor of 424 cu. in.

This drawing is made primarily to show the rotating and reciprocating parts of the motor. I have considered that the center of gravity of each piston is located at the piston pin, and in order to locate the center of gravity of all four pistons in the right hand block when the pistons are at dead center, as shown on the drawing, it is only necessary to bisect the distance between the piston pins and we obtain the center of gravity of all four pistons, as indicated at A.

With the crankshaft in this position, it is very easy to locate the center of gravity in the left hand block, as in this position the pistons in the left hand block are all lined up. Or, in other words, the center of gravity is located at the piston pin, as indicated at B.

The drawing shows an arc struck from the center of the crankshaft and passing through the center of gravity of the pistons in the right hand block at A, and it will be noted that it does not pass through the center of gravity in the left

hand block but instead, passes considerably above it. This result is, of course, due to angularity of the connecting-rods and it can be increased or decreased according to the ratio of connecting-rod length to stroke. The longer the rod ratio it is found possible to use, the less the error will be, and the shorter the rod the greater the error. With any permissible length of connecting-rod, however, this error cannot be cut below approximately 1/2 in. and it is apt to run considerably more than that amount.

A rough way to calculate the magnitude of this out-of-balance is to consider that the engine is equipped with one additional piston, whose weight is equal to the combined weight of all the pistons, and that this piston is reciprocated at twice the crankshaft speed through a stroke equal to the movement of the center of gravity of the pistons.

### A Vertical Vibration

In a single four motor, this movement of the center of gravity, of course, causes a vertical vibration, but in a twin four motor, the conditions are somewhat altered, as the movement of

the center of gravity in one four-cylinder motor cancels the movement in the other four-cylinder motor, so far as the vertical components of these forces are concerned, but add on to each other so far as the horizontal components are concerned.

Fig. 1 shows a line drawn between the two centers of gravity and this line is bisected at C to show the horizontal movement of the combined center of gravity to the right of the vertical center line with the crankshaft in the position shown. Revolving the crankshaft 90 deg. will, of course, move this combined center of gravity an equal amount to the opposite side of the vertical center line. It is the horizontal movement of this combined center of gravity that causes horizontal vibrations in a twin four motor.

Fig. 2 shows a partial cross section of a twin six motor of 3-in. bore by 5-in. stroke, or a total piston displacement of 424 cu. in. In other words, this figure shows a twin six motor of the same total piston displacement as the twin four



J. G. VINCENT

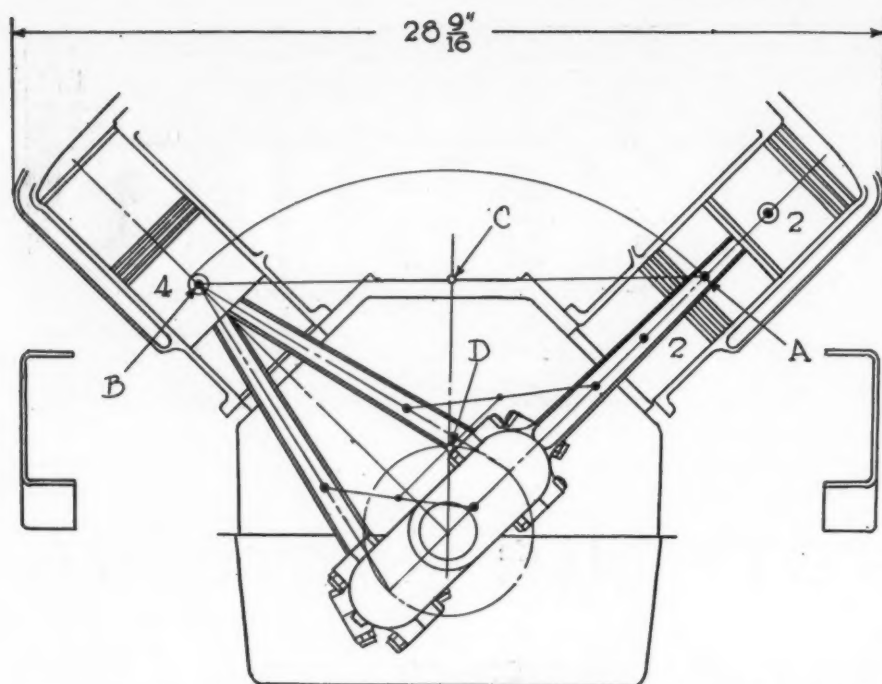


Fig. 1—Partial cross section of the twin four motor is 37-16 bore by 53-4 stroke, having 424 cu. in. displacement

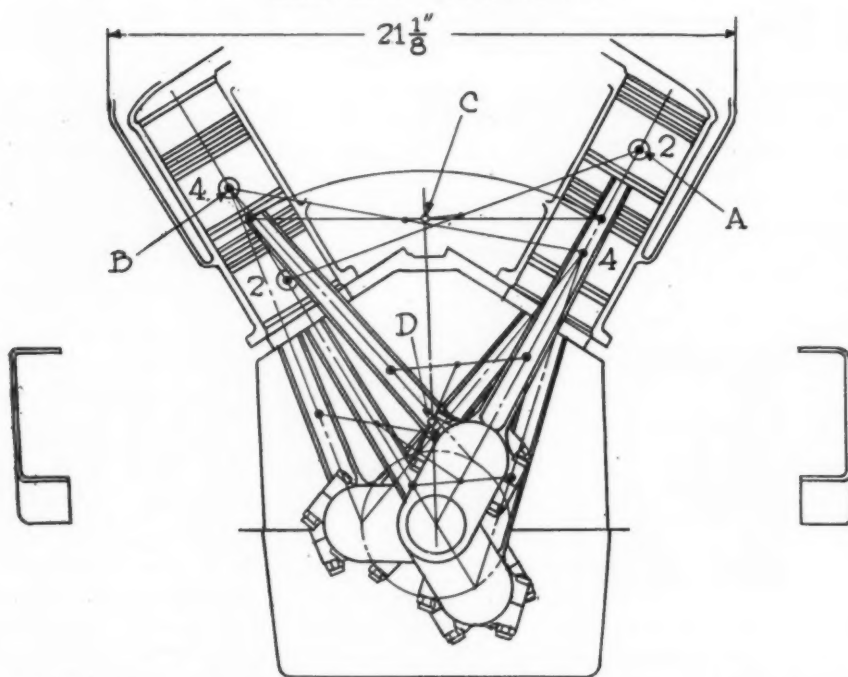


Fig. 2—Partial cross section of the twin six motor of 3 in. bore by 5 in. stroke with a total piston displacement of 424 cu. in.

motor shown in Fig. 1. Like Fig. 1, this drawing is made primarily to show the rotating and reciprocating parts of the motor. I have had the centers of gravity of the pistons in each block located on this drawing in the same manner as described above in connection with Fig. 1, but it will be noted that the arc struck from the center line of the crankshaft passes through the center of gravity in both blocks, and also that the combined center of gravity of all pistons falls exactly on the vertical center line instead of to one side, as in the case of the twin four motor.

The reference letters A, B, and C indicate the same points in this drawing as in Fig. 1.

This drawing, of course, shows the relationship of the parts at only one position of the crankshaft, but by plotting the parts in 360 different positions, in other words, at every

degree of movement of the crankshaft, it will be found that the center of gravity does not move from a fixed point.

It will be noted that I have had the centers of gravity of all the connecting-rods plotted for both types of motor, and in the case of the twin four motor, this point moves off the center line, as indicated at D in Fig. 4, while it remains absolutely fixed on the center line in the twin six motor, as indicated at D in Fig. 2.

I believe that these drawings indicate clearly the difference in forces due to inertia of the two types of motors and prove conclusively the correctness of the six-cylinder principle. The real proof of the correctness of these arguments is, of course, that motors built according to this twin six layout are running absolutely smooth up to speeds as high as 3000 r.p.m.

#### Regarding Accessibility

Figs. 1 and 2 are made to the same scale, and it will be noted that I have had a section of a desirable width of frame shown in connection with each drawing, in order to give a good idea of the general layout of the two motors and the possibilities of locating equipment, etc.

Fig. 1 of the twin four motor shows clearly the difficulty of locating accessories in the usual place alongside of the crankcase, and between it and the frame, and also makes it clear that the steering gear in this twin four type of motor must be located to the rear of the cylinder blocks. On the other hand, Fig. 2 of the twin six motor shows the ease with which the accessories can be located alongside the crankcase, and between it and the frame, and also the additional room for the accommodation of the steering gear. This makes it possible to use a triangular drive and single chain for driving the camshaft, generator and water pump.

The water pump, located just back of the generator and driven by it, is really no more complicated than the ordinary six-cylinder water pump, and it is just as accessible. It has two impellers so placed that the end thrust is balanced, and one delivers directly to one-cylinder block, and the other to the opposite block. With this pump, it is only necessary to have a single stuffing box, which is very accessible for re-packing.

The starting motor is located directly back of the water pump and it is arranged to crank the motor through compound gearing, acting on the flywheel the same as has been standard on our six-cylinder motors for some time past.

The air pump and oil pump are driven by small spiral gears at the rear end of the cam shaft, and the ignition timer unit is driven by a pair of small spiral gears located at the front end of the cam shaft. This makes a remarkably simple, light and quiet arrangement and, in fact, it is more simple and cheaper to manufacture than in the majority of four or six-cylinder motors. This arrangement makes it unnecessary to locate any equipment in the V between the cylinder blocks, with the exception of the carburetor, which is located high up, thus leaving every valve perfectly accessible for adjustment.



Considering this twin six motor as a complete unit, I believe it to be just as accessible as a well-designed single four or six-cylinder motor.

#### Turning Radius Longer

As stated above, Figs. 1 and 2 are drawn to the same scale and make it very clear that the bonnet and, therefore, the frame for a twin four motor must be considerably wider than for a twin six motor of the same piston displacement. It will be noted that the twin six motor is approximately 21½ in. wide over the cylinder blocks, while the twin four is 28 9/16 in. While it is, of course, true that the twin four motor would be a little shorter than the twin six, that is approximately 3 in., it is quite clear that the frame will have to be made enough wider so that the resultant turning radius will be larger with the twin four motor.

A single six-cylinder motor would, of course, assemble into the same width of frame as shown in Fig. 2, but a motor of this type of the same piston displacement would be some 5 in. longer than the twin six and this would, of course, necessitate a longer wheelbase and increase the turning radius. Of the three types of motor, the twin six, is therefore, the best, so far as turning radius is concerned.

#### Weight Saved in V Motors

As indicated in my report to Mr. Joy, I have weighed up a great many motors and have proved to my own satisfaction that of the three types, the six-cylinder will be the heaviest, and that the twin four and twin six will be just about a stand off, granting, of course, that all three types of motor are made up to a corresponding standard of engineering.

#### Continuity of Torque

As mentioned in my report to Mr. Joy, it is obvious that the character of the torque of the twin six is bound to be 50 per cent better than the twin four and 100 per cent better than the single six, and in order to show the characteristics of these three types of motor I have had Fig. 3 prepared.

The diagrams shown in this drawing cover 360 deg. of crankshaft rotation, or, in other words, one-half cycle. All three diagrams are made to the same scale and are all based on equal size motors; i.e., 424 cu. in. of piston displacement.

It is, of course, obvious that the center diagram represents the power impulses of a twin six, the upper diagram a twin four, and the lower diagram a single six.

In each diagram the horizontal lines *O-O* represent zero, the solid line curves *B-B*, below the zero line, represent negative crank effort due to compression, while the solid line curves *C-C* represent crank efforts due to the working strokes. The dotted line curve *D* represents the net crank effort. This curve was plotted by taking the value of the crank effort curves above the zero line and subtracting the negative crank effort curves due to compression, as indicated below the line. These curves *D* show clearly the relative work to be accomplished by the flywheel in the three different types of motor. The uniformity of the torque of the twin six as shown by the curve *D* gives a fair idea of what this torque should be, and I can assure you that the actual performance of the motors is well up to what might be expected.

The frequency of the impulses and the small amount of difference in effort between the peak of one power stroke and the lowest point in between impulses absolutely do away with any indication of separate motor impulses.

I have driven a car equipped with one of these twin six motors down to speeds as low as 1 mile per hour, representing a motor speed of considerably less than 100 r.p.m. and under these conditions there is no sense of separate impulses whatever, even when accelerating quickly from this speed.

This continuity of torque, which makes for smoothness at low speed, coupled with the light, accurately machined re-

ciprocating parts, plus the six-cylinder principle, which make for smoothness at high speed, result in a wide range of smooth ability which, when once experienced, is bound to be desired.

Fig. 4 shows the actual horsepower output of a Packard 338 single six-cylinder motor of 415 cu. in. of piston displacement and a Packard twin six motor of 424 cu. in. of piston displacement.

#### Discussion Along Varied Lines

C. C. Hinkley, chief engineer, Chalmers company: Isn't it true that in the Packard twin six, the crank is a 2-in. crank? Am I correct?

J. G. Vincent: That is correct.

C. C. Hinkley: For a 3 by 5 twin six; I believe we would call it common practice to use at least a 2-in. crank, in a single six engine with that displacement, with perfect propriety. In the type of engine that I noticed in the cut, Mr. Vincent uses a vibration damper. I would like to ask Mr. Vincent if he compensates for the lack of crank diameter by the vibration damper, or what is the function of the damper?

J. G. Vincent: In experimenting with this motor, we ran into the same thing we would have run into had we designed a single six high-speed motor. That is, the synchronized vibration due to the slight oscillation of the crankshaft. Now, that is not affected by the twin six design, but to a very limited degree. That is, the added rotative weight just mentioned has a very slight effect on the periodicity in the crankshaft. By that I mean that when the front throw of the crankshaft is slightly displaced by the impulse due to the piston working stroke, it will come back more slowly with a little added rotative weight, with the result that the impulses in the motor will get into step with it at slightly slower speed than if the rotative weight was lighter. To that extent, the V type of motor does affect crankshaft design. Now, we could have overcome the vibration, the periodic vibration, by making the crankshaft larger. That is, we could have overcome it at lower speeds, but it would have

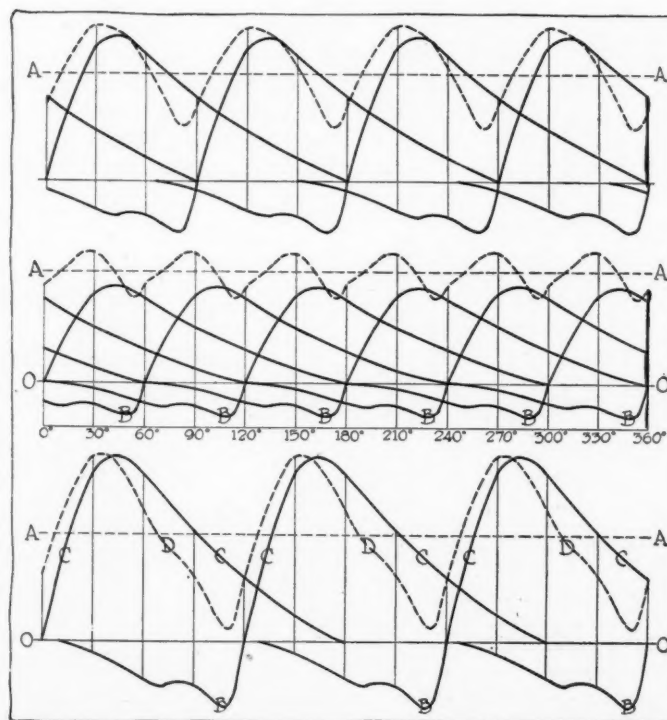


Fig. 3—Chart showing continuity of torque covering 360 deg. of crankshaft rotation, or, in other words, one-half cycle for three motors of 424 cu. in. piston displacement representing the power impulses of a twin six in the center diagram, a twin four in the upper diagram and a single six in the lower

been bound to come in at some speed. You cannot make a crankshaft, within reason, and make it strong enough so that it won't spring a little; in other words, the larger you make it, the faster will be its periodic pendulum action, and the faster the motor will have to run before the pistons get into step with it.

#### Periodic Vibration

Now, in reference to the pistons getting into step with it, it is just like stepping up to someone, swinging and pushing them at the right time as they come back each time, and you keep them going. The minute that you hit them a little too quick, or too light, they will begin to slow up. The same thing with a crankshaft. The period of vibration ordinarily does not last over a range of more than  $1\frac{1}{2}$ , 2 or 3 miles. If it comes in, say at 40 m.p.h., it would come in with increased intensity at 80 m.p.h., were it possible to get that high. In other words, double the motor speed. We, of course, had the choice of going to an unusually large crankshaft, but still having the possibility of having slight vibration or disturbance at extremely high speed; or putting on the vibration damper. By putting on the vibration damper, we damped out that period without making any larger crankshaft, and we were, therefore, enabled to retain the smaller crankshaft, with its lower bearing speeds, which makes for efficiency, and we simply chose the vibration damper.

#### What Vibration Damper Does

Just a word as to what the vibration damper does. It is simply a brake on the swing; that is, if you put a board on each side of the swing, and bear up against the ropes, you would give the swing a push, it would probably go to the other end, but it would not come back very fast, and when it came back to the center, it would stop. The crankshaft oscillation is exactly the same thing. The vibration damper does not prevent the shaft from springing slightly, but it does prevent it from oscillating and setting other parts into synchronized vibrations. I might state that it seems to smooth the motor throughout its entire range; and it is very effective so far as damping out periodicity is concerned.

#### Displacement-Car Weight Ratio

A. Ludlow Clayden, *THE AUTOMOBILE*: I would like to introduce to the discussion a line of thought touched upon by Mr. Vincent but not followed very far, this being the proper proportion of piston displacement to the total weight

of the automobile. We gain ability of performance in proportion as we increase the total volume of gas swept by all the pistons during a yard of travel and we can always get more ability by lowering the gear ratio or by increasing the size of the engine. There must be some limit to this procedure. For instance it would be absurd to put a Packard twin six engine in a Scripps-Booth chassis as it looks at present, equally ridiculous to suggest that the Packard ability could be obtained from a six-cylinder 3 by 5 geared nine to one on high. Possibly in the fullness of time we shall discover that neither of these extremes is absurd, but it is interesting to examine the figures for displacement per foot of travel for a few well known cars. This means nothing, however, without consideration of the weight of the cars; wind resistance counts for little or nothing as ability is appreciated and desired most at speeds below those at which the atmospheric friction begins to count.

Taking the following list we have these figures:

	Cu. In.	Gear	Ft. Wheel Circ.	Cu. In. Per Ft.	Weight	Cu. In. Per 1000 Lb. Ft.
Packard ..	424	4.4	9.7	192	4,500	43
Cadillac ..	315	4.4	9.4	147	4,300	34
Hudson ..	288	3.7	8.9	132	3,000	44
Scripps ...	104	4	7.8	53	1,750	30
Ford .....	177	3.6	7.8	82	1,500	55

This method of figuring is only a very rough and ready way of making comparison, but it serves to show that ability can be increased greatly by reducing weight. Of course the weight is not a true measure of the resistance to motion but it is obtainable easily while drawbar pull is not. Mr. McCain has shown me a different way of estimating ability, based upon the tractive effort at the tire at different speeds, calculating from the known horsepower of the engine at the corresponding rate of revolution and I hope he will quote some of his figures. It is hardly possible for an outsider like myself to obtain such data from a sufficiently large number of plants to enable proper comparison to be made.

#### Twelve the Limit

Now the question is whether the eights and twelves and light sixes we have to-day provide sufficient ability, too much ability or not enough ability. It seems that the present consensus of opinion is that the ability of the twelve represents about the limit that the public is ever likely to ask but that smaller and cheaper cars than the very large ones will have to approximate the same figure of merit.

#### Road Performance

Taking my table it is obvious that the figure of merit of fifty-five for the Ford does not truly represent its ability as compared with the lower figure of forty-three for the Packard, but we know that the horsepower of the Packard is vastly greater than that for the Ford. Thus to convert my figures of merit into others which would show a truer comparison it would be necessary to know the horsepower for each engine. I am going to ask Mr. Vincent and Mr. McCall White if they can give the power developed per cubic inch piston displacement at 1000 r.p.m. This multiplied by my figure of merit ought to show a true comparison between the conditions of the two cars which we know represent about the limit of ability that has yet been reached in practical manufacture. Suppose that the result of this multiplication gave a figure of 300, which would be the Packard case at a rating of 1 hp. per 7 cu. in. approximately, then it seems to me that 300 might be taken as a constant to which other engineers could work. I am afraid I have not made this very

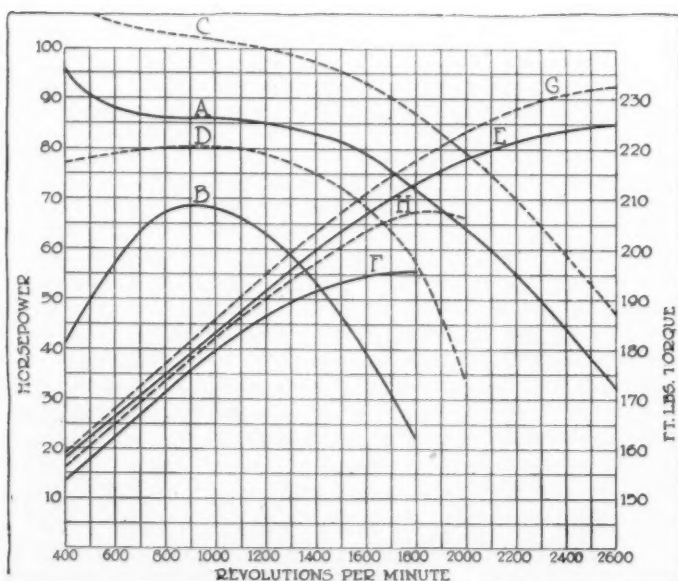


Fig. 4—Showing the actual horsepower output of a Packard 3-38 six of 415 cu. in. and a Packard twin six of 424 cu. in.



clear, but I mean that the ability, the road performance, of cars which can show the same figure of 300 say, ought always to be about the same. We see that the figure can be produced by weight reduction and is possible of attainment without phenomenally low gearing by a small four-cylinder automobile.

#### An Equation for Merit

I do not suggest that I have considered everything in this suggested equation, no doubt many holes can be picked in the argument, but I do think that it ought to be possible to develop an equation which would give us a true figure of merit and if this can be done it would be very useful to engineers.

Now I want to say a few words on the multi-cylindrical question. Mr. Vincent's paper is a splendid argument for the V motor principle and is almost equally favorable to eights as to twelves. The cheap eight is a better car by comparison with the expensive one than the cheap six of a couple of years ago was by comparison with the better class car. How small, then, is it going to pay to make a twelve?

Suppose we can find a possible ability equation and so design a car as to suit the desired figure of merit, what then is going to decide how we shall split up the necessary number of cubic inches per road wheel revolution? The choice offered is so immensely wide, ranging all the way from 2 to 1 down to 6 to 1 in gear ratio and from four to twelve cylinders.

#### Cylinder Size Main Factor

I have lately been told by many engineers that the cost of a motor of a given standard of workmanship is in proportion to its piston displacement and that the number of cylinders had little to do with it. The most remarkable statement is that the V twelve costs no more than a six of the same capacity. Thus it seems to me the ultimate deciding factor will be the individual size of cylinder that will give us the best horsepower. Mr. Vincent says that the volumetric efficiency increases as the cylinder size decreases, by virtue of increased compression which is possible with the smaller cylinder. With this view I am in accord within limits, but I am not convinced that the Packard twin has not cylinders that are already a little on the small side. There must be a comparatively narrow range of size which will give the highest horsepower combined with other qualities. If manufacturing conditions abroad were normal I would try to persuade the Sunbeam company to build an eight and a twelve of the same total size as their six and I sincerely trust that some live manufacturer will try what can be done with a 300 cu. in. racing car with eight and with twelve cylinders. Europe has always thought the four was the only possible racing engine and it will need a racing car with more cylinders to shake this view anywhere in the world. American genius has brought the multi-cylinder V engine into a position of such prominence that it is the absolute duty of American engineers to see this thing through to the limit, and the limiting test of an engine is the speedway. If a 300 cu. in. twelve can hold its own on the racing track the case for minute cylinders will be proved, but it seems impossible to prove it by any other method.

#### Ability Defined

C. T. Myers, engineer Timken-David Brown Co.: I would like to ask Mr. Vincent if he will give us the definition of "ability"; also the terms "smooth ability" and "range of ability."

J. G. Vincent: We, out at the Packard factory, use the term "ability" simply as a relative definition of a car. In other words, we take a car out, and test it for acceleration. The greater the range of speed that car will show on either drive, that is, from the lowest to the highest, is what we call that car's "range of ability." Now, supposing that the

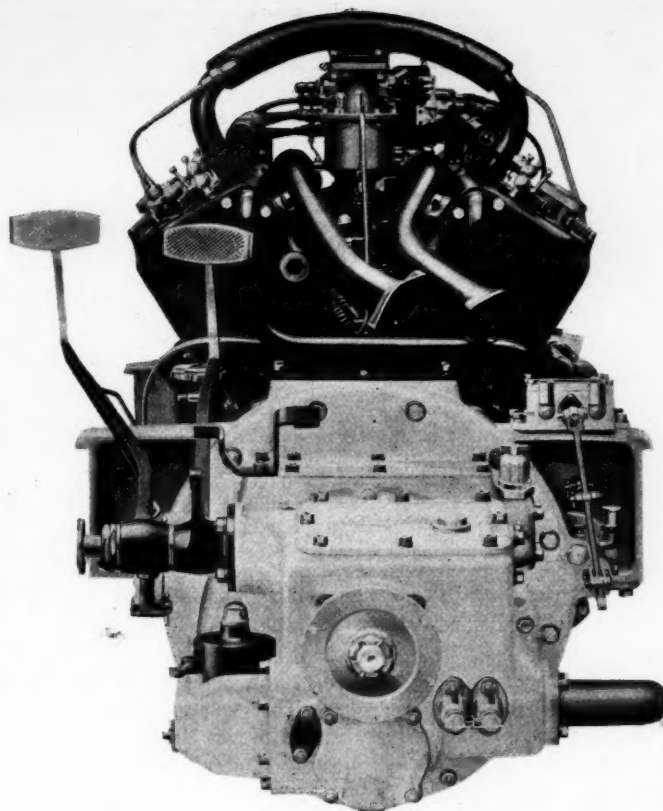


Fig. 5—End view of the Packard twin six motor

car would go from 1 or 2 m.p.h. to 70 m.p.h., on high gear, smoothly, and without vibration at any period, we would call that a large range of smooth ability. In other words, if you have two cars and start them off on high gear at the same speed, and one car pulls away from the other, we would say that the car that got away had the greatest ability. Now, it might not have the greatest ability over all ranges of speed, but it would have the greatest ability for that test. If it has the greatest ability all the way up the range, then it would have a larger range of ability than the other car.

C. T. Myers: What is your definition of "ability" itself? What is the comparison?

J. G. Vincent: Generally speaking, acceleration—acceleration on a given gear ratio.

C. C. Hinkley: Is that a time element?

J. G. Vincent: Of course, acceleration would naturally mean a time element.

C. T. Myers: What would the acceleration be?

#### Testing the Car

J. G. Vincent: To make my point clear, I will try and do it this way. If we went to test a car for ability, we might take it out to-day, and if we are feeling pretty good, that car would feel about so to us. If we took it out next week, the car might feel better or worse to us; we might have changed, but the car might be just the same; so, in order not to fool ourselves, we adopted the scheme several years ago of using what we call acceleration curves. Later on, we have measured the ability with an accelerometer; but we still use the acceleration curves taken with a tested out speedometer, starting the car at a known speed, say, 5 m.p.h., and then taking a reading every 10 sec. up to 60 sec., and we get a very accurate acceleration picture of what that car's ability is. Now, we file that away. We will suppose that car accelerated from 5 to 30 m.p.h. in 10 sec., or from 5. Supposing we build a car next year that accelerates from 5 to 32 m.p.h. in the same time, then we would say we had increased the car's ability. Of course, we do some test work

for hill climbing, and so forth, but, generally speaking, acceleration curves are made on the level; and by the way, we take them in both directions and take the average, and it is a very good indication of what the car's hill climbing ability will be. In other words, to a certain extent the acceleration takes into account the weight of the car.

#### Smoothness of Motor

Smoothness, of course, the smooth part of the ability, simply refers to the action of the motor while it is performing that given work.

A. C. Woodbury, S. A. E. Standards Recorder: I have heard, in regard to the Packard Twin Six, the statement that carburetion trouble was very slight, and at very low speed. It has been the general experience that carburetion troubles have entered in at low speeds of engines, because of the gas speed in the inlet pipe being so small it would not carry the gasoline up the cylinder. I would like to inquire if there are any Packard secrets that we can learn in regard to that.

#### Carburetion Problem Easy

J. G. Vincent: I will admit that I was a little bit surprised myself, how very little trouble we had with the carburetion problem. We, of course, were very careful in designing the engine; very carefully proportioned capacities, to be as near right as our experience would dictate, and we very carefully took care of the heating of the gas. In other words, the individual header that goes into each cylinder block is surrounded by water on approximately three sides. Of course, as soon as the motor warms up, no condensation takes place. Then, of course, valve timing must be taken into consideration, and the inlet valve location with reference to the center of the opening into the block, and then the heating of the manifold above the carbureter. In designing that, we did not do anything more than use our information that we had gained through years of manufacturing six-cylinder motors. The carbureter used is exactly the same size as our last year's single six-cylinder. The carbureter and the parts are just the same, with the exception that the inside spring of the air valve which we found possible to make somewhat softer on account of the uniform suction of the motor. In other words, you all know, with an air valve carbureter, you get a certain amount of flooding on the four-cylinder motor, and you get less with a six, but still you get a little flooding, and the inside spring, commonly

called a buffer spring, has to be made of strength that when you step on it quick, the flooding of the valve will not allow too much air in. In other words, to lean your mixture too much. We found the constant suction of the twin six motor allowed us to reduce the strength of that spring about one-third. That is absolutely the only change. Of course, the main part of the carbureter is not very high. It is  $1\frac{3}{4}$  in. bore, same as for the single six, but where the manifold is divided, to go into each block, we naturally made it a little smaller and cut it to  $1\frac{1}{2}$  in., as I remember.

A Member: That is a single carbureter?

J. G. Vincent: That is a single carbureter; single jet. In other words, just exactly the same choke and jet that we use in the six-cylinder.

A Member: May I ask what acceleration test the Packard twin six gave in seconds, at, say, from 5 to 50 miles?

J. G. Vincent: From 5 to 50; of course, it varies, but under ideal conditions, I have done it in 24 sec.

William B. Stout, chief engineer, Scripps-Booth company: In the small bore multiple cylinder motor, and the ability to get the valves smaller, is there not an advantage worth going after in the overhead valve, in the multiple-cylinder type? I would like to get your opinion on that.

J. G. Vincent: That is the old story of a lot of considerations. I don't know. We do know the very wonderful all-around efficiency of the L-head motor, when well-built. You can throw the valves in and take them out pretty easily. Most anybody knows how to take care of them. Of course, within reasonable limits, you can get as much compression as you want with an L-head motor, anyway, and within reasonable limits, I agree with Mr. White, of the Cadillac, that you can get about all of the efficiency out of the L-head motor that you can out of the valve-in-the-head motor. You can get a little more out of the valve-in-the-head, I believe. Of course, at extreme speeds, I know you can get a whole lot more, but I have yet to see a valve-in-the-head motor that will really stay quiet over a long period of service, and there are usually some difficulties about grinding valves, and things of that kind. Of course, if I were going to design a racing motor, I would design a valve-in-the-head motor, naturally, because there is nothing but power which counts, but in building an automobile motor, you must take into consideration a lot of things; power is just one important item.

I don't expect any movement, or any great movement, toward valve-in-the-head motors, especially in the higher-priced cars.

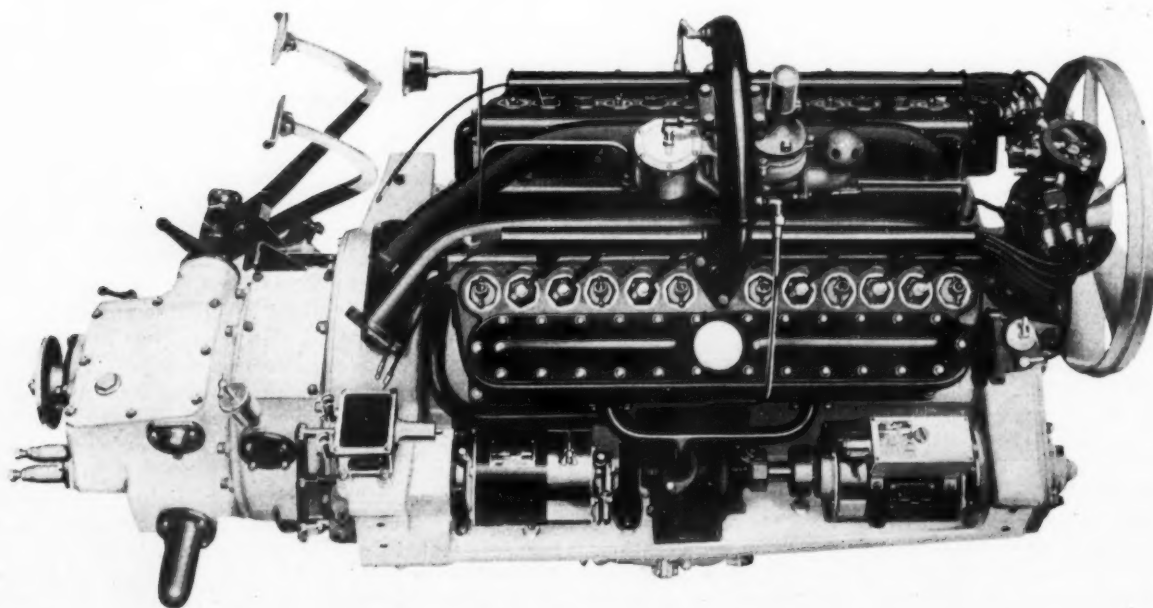
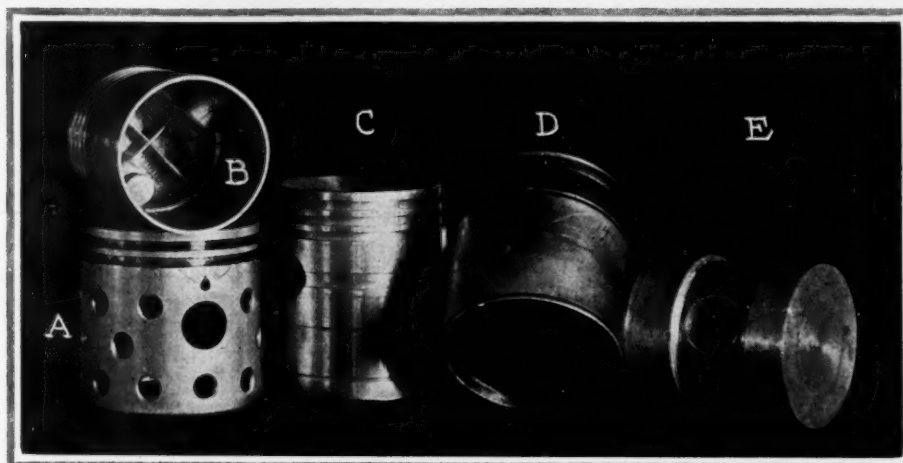


Fig. 6—Plan view showing the layout of the accessories in the Packard twin six motor





Northway adaptation of the hour-glass type of aluminum alloy piston which fulfills the requirements for this type of casting



A—Piston lightened for high-speed six-cylinder racing motor use. B—Showing exceedingly fine ribs possible of attainment with Cothias process. C—Piston used on Knight motor. D—Run for 490 consecutive hr. at 1300-1400 r.p.m. under full load. Equivalent to 18,000 miles at 35 m.p.h. Wear less than 0.00025 in. E—Hourglass type rapidly gaining favor

# The Aluminum Alloy Piston

Some Points of Superiority—Increasing Bearing Life—  
Lessening Vibration—Preventing Injury to the Cylinder  
Under Overheating Conditions—Few Defective Pistons

By James E. Diamond\*

**A** FEATURE of the meeting of the Indiana Section of the Society of Automobile Engineers, in Indianapolis, Thursday evening, Sept. 23 was the paper by James E. Diamond, engineer of the Aluminum Castings Co., which was scheduled to follow J. G. Vincent's paper on the twelve-cylinder motor. Mr. Diamond's paper is given herewith in full:

It seems altogether fitting in a discussion of the twelve-cylinder motor, a type which has immediately commended itself to the automobile public, that the aluminum alloy piston, certainly a factor in this motor's greater success, should not be neglected. It is a happy circumstance that almost coincident with the advent of the V-type, multi-cylinder motor, one in which the reduction of the reciprocating mass to a minimum is an all-important desideratum, was the development of a successful aluminum piston alloy, successful from the standpoint of both maker and user.

It is my intention to comment on some points of superiority of the aluminum alloy piston, even though this undoubtedly involves a repetition of facts which are more or less familiar to you since this type of piston has been the subject of much discussion in recent months. Certain phases of piston design will also be considered later. The advantages of aluminum alloy pistons generally will first be touched upon, and I then shall endeavor to make clear the decided superiority of pistons made by the Cothias process, more commonly known as permanent mold pistons, to those cast in sand.

## Weight of the Alloy

The weight of the aluminum alloy piston is, roughly speaking, but one-third that of an iron piston of the same design. It immediately follows that the inertia forces due

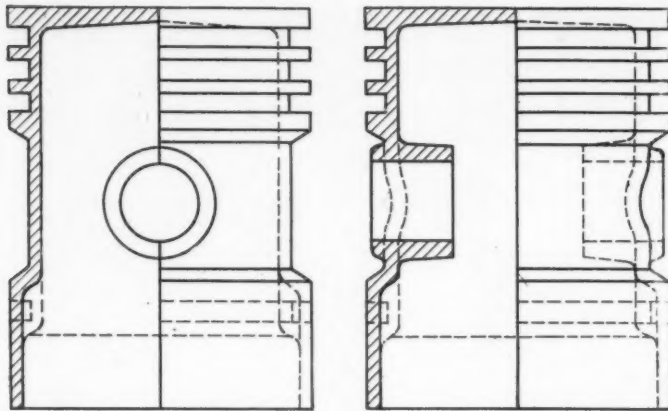
to the purely reciprocating mass, that is, the piston itself, may be reduced approximately 67 per cent by its use. Again it follows that the vibration-producing forces attributable to inertia conditions are decreased to the same extent, by the vibratory force due to the lack of balance between opposed vertical forces present in vertical motors, or unbalanced horizontal forces, as in the V motor. Crosswise vibration is disagreeable if nothing more,—much more disagreeable than vertical vibration,—and the smaller these may be made, the more the likelihood the motor will be able to absorb this vibration within itself.

## Increased Bearing Life

In reducing the inertia forces responsible for vibration, another very desirable object is being attained, namely the diminution of the bearing pressures, engendered by these self-same forces, this equivalent of course to increased bearing life—a consideration of no mean importance. It is easy to underestimate the magnitude of these forces, but with the present tendency toward the small bore, long-stroke, high-speed motor, more attention must be given this phase of motor design. It is quite safe to say that in some of the recent European racing products, these inertia forces are of greater magnitude than the working forces in the motor. Theoretically, this may be shown, and theory is supported by tangible evidence that this is so.

Incidental to these advantages it may be said for our own particular alloy, that its bearing qualities are excellent, its coefficient of friction being but approximately 50 per cent that of cast iron. A slight gain in mechanical efficiency should result, and possibly the reduced friction explains a decided decrease in the consumption of lubricating oil in several cases that have come under my observation at one time or another, where the iron pistons have been displaced by Lynite pistons. Doubtless, too, the much greater thermal

\*Editor's Note—James E. Diamond is the engineer of the Aluminum Castings Co., Cleveland, O., manufacturer of Lynite pistons, and is an authority in this field.



Sectional drawings showing the construction of the hourglass type of piston

conductivity of the aluminum piston plays a part in this result. In any event, it seems reasonable to suppose that less friction would reflect itself in a smaller consumption of oil.

The greater thermal conductivity of this piston also explains why the carbon deposit on the head is so much less than experienced with iron pistons. As a rule the little carbon that collects is easily removed. In fact, under favorable lubricating conditions, no carbon is deposited.

#### In Case of Overheating

Another feature will commend this type of piston to you. Should a motor overheat and a piston seize, only in rare cases does harm to the latter result, and practically never is injury done the cylinder. On the other hand, if piston seizure occurs in an iron-pistoned motor reboring and regrinding are the usual order, frequently a new cylinder block being required.

Considering now the advantages that the piston made by the Cothias process has over the sand-cast one, we have found this permanent mold piston quite superior to the former in every respect. The point of superiority in which its pre-eminence is most marked and which has the greatest practical value is that its hardness is approximately 25 per cent greater, consequently its resistance to wear greater to the same degree. One of the troubles with aluminum pistons has been that they have been too soft. By this process pistons are being made that have a hardness not very much less than that of cast iron.

While the strength of the sand-cast piston is ordinarily sufficient for requirements, the increase of strength inherent to this Cothias process is, or should be, welcome, and the tensile strength will range between 25,000 and 30,000 lb. per square inch—quite a little higher than that of ordinary iron. As of passing interest, a case is recalled where some sand-cast pistons of scanty proportions failed a few hours after they had been put into a motor. Later pistons of identically the same design were produced by this process, and are running to-day, at last accounts, the mileage being considerably in excess of 10,000.

From the standpoint of manufacture, also, the permanent mold piston is a better and cheaper proposition. Usually pistons come from the molds with not more finish than may be ground off in one operation. The reference to grinding is made advisedly, for while it may be true that some aluminum alloy pistons cannot be satisfactorily ground, Lynite permanent mold pistons may be, and are being successfully ground in production.

Kerosene is a satisfactory grinding medium, and I also believe, turpentine will do very nicely.

The wristpin holes are cored and brought closely enough in size in some cases to require a reaming operation only.

An advantage also measured in dollars and cents is that

the percentage of pistons found defective in the shop after machining operations have been performed upon them is very much less than that of sand-cast pistons found defective after a similar expenditure of time and labor. In this connection the superintendent of a plant manufacturing high grade motor cars,—the motors of which having had aluminum alloy pistons as standard equipment, for some time and Cothias process pistons for several months,—recently told me that their defective loss had dropped 90 per cent when this change was made. Foundry practice, respecting sand castings, it is doubtful, will ever be refined to a point where allowances for finish need not be as liberal as presently required. With the exercise of the greatest care piston sand castings will vary from one to another. This excess stock represents quite a bit of metal for which the foundry quite properly must be paid, and yet which not only usually represents a dead loss, but also in most cases represents an additional item of expense, in that additional operations for its removal are required.

#### The Use of Ribs

Relative to design, this may follow very closely that for the iron pistons. However, in my opinion it is advisable to rib the head, the better to carry away the heat from it, in this way eliminating the possibility even, that the continued subjection to high temperature result in a gradual deterioration of the metal. Whether one rib or two be employed if the rib in the plane of the bosses is dropped down to them, stiffness is given where stiffness is required and the ring-carrying portion of the piston more rigidly and strongly bound to the rest of the piston.

#### Oscillating the Pin in the Piston

There are as many advocates of the practice of oscillating the pin in the piston as there are of locking the pin in the piston and rocking the rod. While each has its advantages, the former construction is certainly the cheaper, and where used the results have been uniformly highly satisfactory. I have examined pistons of this type that have seen many thousands of miles service, in which the wear in the wristpin holes was not measurable.

Whenever it is possible, it is wise to increase the length of the piston, possibly 25 per cent. This of course, gives more bearing surface. It is also good practice to increase the width of the first land, also to fit the rings rather more tightly than is customary in fitting rings in iron pistons. The reason for this is self-evident.

#### The Question of Expansion

One question that invariably arises is relative to the greater expansion of aluminum, and the clearances required. No set rule can be laid down. The proper clearances must be determined by experiment for each particular type of motor. In many cases if the piston barrel is tapered, it is possible to eliminate entirely piston slap.

#### Hourglass Type Gains

At the present time, the manufacture by the Cothias process of pistons of a design providing for the employment of a so-called wiping ring at the bottom of the skirt is not a commercial proposition, where strict adherence to conventional design is insisted upon. However, as the process adapts itself to the manufacture of pistons of the "hour-glass" type, the same end may be attained. The prejudice against this type of piston is rapidly disappearing. Many who were skeptical six months ago are no longer so, and you will be interested to know that one of the largest manufacturers of motors in the country has standardized on Cothias process pistons of the general "hour-glass" type.

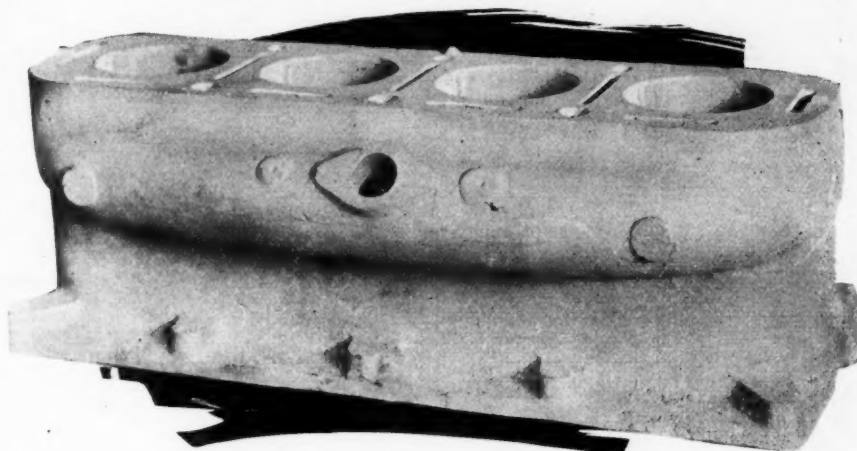
I believe it entirely proper to remark in conclusion that my company already has in hand orders aggregating a half-million pistons, pretty fair evidence that the aluminum alloy piston has arrived.



# Lower Weight—Higher Efficiency

A. L. Clayden Answers F. R. Porter—Thinks Weight and Performance Will Be Sales Factors in Future

*At the right is illustrated an aluminum casting for a Knight motor which will have no cylinder liners but will use cast iron valve sleeves and aluminum pistons. This is an experimental job, but if successful it is likely to be followed by regular production. The saving in weight is considerable. Aluminum cylinder heads have been used on Knight motors before with perfect results, but this is the first all-aluminum attempt*



**D**ETROIT, MICH.—Editor THE AUTOMOBILE:—In his letter published in THE AUTOMOBILE for Sept. 2, F. R. Porter states that he thinks the automobile of 1917 will have to carry seven passengers with a motor of not more than 200 cu. in. capacity and argues therefrom that every part of the engine will have to be made from the strongest possible material. Far be it from me to venture any prophecy in definite terms, for I know full well I should never have predicted the twin fours and sixes, and experience teaches that prediction in the automobile field is somewhat risky, but I am tempted to tilt a lance with Mr. Porter on this subject in the light of past experience.

Naturally, I am always a little liable to argue from European experience as a basis, but on the question of motor efficiency it is unobjectionable to do so because Europe has tried out engines with the maximum of volumetric efficiency possible to date. A year ago, when the British and French manufacturers were getting ready their 1915 designs that would have been seen last fall, had it not been for the war, it was quite noticeable that the tendency was distinctly toward a slight *reduction* in volumetric efficiency.

## Efficiency Can Be Carried Too High

This was because the ultra high efficiency motor is ultra sensitive to any sort of derangement, is ultra costly to build and is ultra heavy for its power. In this connection it may be well to look at aeroplane engine development. It was thought in Europe in 1912 that the best possible engine for aeroplane work would be one following the ideas of the racing car motor, and I confess without shame to having supported this notion, finding myself in such good company as that of F. W. Lanchester and many other expert engineers. But actual trial showed that aeroplane engines of low volumetric efficiency gave better results in practice; that engines built with the sole idea of obtaining the most power from the least weight were altogether different from the high efficiency engines that the racing car had brought into being. Broadly, the explaining reason was that the racing car engine was so highly stressed that it had to be heavy if reasonable reliability was to be obtained.

Coming back to the car again, Mr. Porter has suggested 200 cu. in. as the ideal size. Now, in 1912 and 1913 one of the most popular sizes for European automobile engines for cars with a four- or five-passenger capacity was 3 liters or 183 cu. in. roughly, and many such motors developed a maximum power of from 45 hp. to 65 hp. at about 3000 r.p.m. which is 1 hp. for each 3 cu. in. approximately.

Use of these engines showed that poppet valves were

troublesome, because the power fell off so fast if the tappet adjustment was a hairsbreadth out of true, if the ignition was not in perfect condition and if the carbureter was not highly tuned. With Knight motors the efficiency did not depend upon the valves, of course, but the very high-efficiency Knights had their troubles none the less.

As a consequence the 1914 engines were a trifle larger than the 1913. Several makers changed from a millimetric bore and stroke of 80 by 130 mm. to 80 by 150 mm. or even to 90 by 135 or 150 mm. Cars which had been regarded as wonders for their engine size were made better performers, between the 1913 and 1914 seasons, more by increased dimensions than by increased mean effective pressure or increased speed, and if the 1915 cars had appeared it would have been seen that this tendency had persisted.

## What Is Efficiency Limit?

Whether we have reached the useful limit of horsepower yet remains to be seen, but it stands to reason that there must be a limit. There must be an explosion pressure beyond which it does not pay to go. The conditions of an automobile motor are so complicated, and an automobile engine has to do so many things no other kind of engine is asked to do. I do not for a moment say that higher mean effective pressures will not be used in the future, but I do think that we are near the limit unless the whole scheme of the motor undergoes some change. If there is a type of gasoline engine which has not yet been discovered, anything may happen, but with the present poppet valve or Knight motors I feel fairly confident that reliability will be difficult of attainment if we increase the pressures much above 1 hp. for each 3 cu. in. at maximum power, or if maximum power is developed at speeds much above 2800 r.p.m.

Again let me say that all sorts of things *may* happen, but confining attention to modern experience I think we have the limit of pressure for an internal combustion automobile engine well in sight—for commercial work that is, though perhaps not for racing. If this be agreed upon, then I think it is most probable that the free use of aluminum and the copying of aeroplane constructors' practice will help the automobile manufacturer and the motorist more than anything else. I think that we are nearing the day when nobody will care much how many cubic inches a motor has, but will regard only the weight and the ability. In other words, the performance on the road and the cost of that performance in fuel, oil and tires. It is emphatically the car that is light in weight by comparison with the passenger load it can carry which is going to come out on top.—A. LUDLOW CLAYDEN.

# Rickenbacher Wins Narragansett 100-Mile

Maxwell Covers Distance at 67.1 M.P.H.—Burman Wins 25-Mile



Above—Bob Burman in his Peugeot which won the 25-mile race on the Narragansett Park speedway last Saturday with an average speed of 69.76 m.p.h.

Left—Rickenbacher changing a tire on his Maxwell which won the 100-mile event at an average speed of 67.1 m.p.h.

By James T. Sullivan

PROVIDENCE, R. I., Sept. 18—Eddie Rickenbacher, in a Maxwell, won the most sensational automobile race ever seen in New England when he captured the 100-mile contest here to-day averaging 67.11 m.p.h. He came from behind and by sensational driving made up lost laps and then swept into the lead. His time for the 100 miles was 1 hr. 29 min., 24.75 sec., an average of 67.1 m.p.h. This is claimed to be a new record for the distance on a 1-mile track, the old record having been held by Tom Alley in a Duesenberg, made at Minneapolis in 1914 and which was 1 hr., 31 min. 30 sec., or 65.57 m.p.h. Another record claimed to have been made was that for 1 mile by Bob Burman before the race started when he circled the track in 45.73 sec., the 46.20 made by Louis Disbrow in St. Louis a year ago having been the best previous mile on a 1-mile track.

The races were staged on the new Narragansett Park speedway, an old horse track that has been asphalted. The curves are banked about 25 deg. and the track is 50 ft. wide. It was stated by F. E. Perkins, head of the Narragansett Park speedway organization, that there were 40,000 people present, there being 38,000 paid admissions.

The big race started shortly after 3.30 p. m. with fourteen cars lined up in two rows of five and one row of four, with about 10 yd. between each row. They were sent around for a flying start and they kept well together so that they got the flag on the first time around. Then the race was on in

earnest. And from beginning to end of the 100 miles only four of the contestants did not stop, Burman, De Palma, Haupt and Jones. The asphalt seemed to wear the tires, particularly as they went around the banked curves where the cars bounded a bit, showing the track was somewhat rough. The weather was ideal for the race, cool and bracing, but it had been so hot previously during the tryouts of the previous days that the carbureters had to be adjusted.

Rickenbacher shot into the lead on the first lap, but was crowded back into third place before the second mile ended. There he held his place, watching the speed of the others and always within 50 ft. of the leader.

## Rickenbacher Falls Behind

But he had to stop in the fifteenth lap with carbureter trouble. Before he got going the leaders had passed around three laps. Rickenbacher cut loose, however, and very soon it was apparent that the little car with 1 on its radiator was coming around very frequently. First it was noticed that it had regained the laps lost to the tailenders of the field. Then when 33 miles had been covered he had won back a lap, the leaders being 33 and Rickenbacher 31. Soon he was in third place. De Palma then started a spurt, whirling past Burman and trying to lengthen out the distance, but he could not get very far, for Burman was always within 10 yd. of him.

De Palma had the lead in the 37th mile and from that time to the 57th, or a distance of 30 miles, he kept in the van. But every time he and Burman made a mile in 54 or 55 sec., Rickenbacher did it about 50 or under. So he continued to cut down the lead. Before 50 miles had been reached he had circled all the others again and so they were then but 1 mile ahead of him.

Burman then began to show signs of speed, and to tear away from De Palma, having passed into first place on the 58th mile. And each mile while Burman was leaving De Palma behind, Rickenbacher was gaining on both. The spectators then began to sit up and shout. And the shouting encouraged Rickenbacher, for he smiled and let his car out a little faster.

When 60 miles had been reached he was swinging around the upper curve with an abandon that seemed reckless, for he appeared to be handling the car like a toy. It

## How the Cars Finished

100-MILE EVENT				
Driver	Car	Time	Prize	
Eddie Rickenbacher	Maxwell	89:24.75	\$4,000	
Bob Burman	Peugeot	91:21.55	2,000	
Willie Haupt	Duesenberg	91:24.25	1,000	
Ralph De Palma	Stutz	91:42.70	700	
Peter Henderson	Duesenberg	92:25.35	600	
J. A. Myers	National	93:42.50	400	
Ira Vail	Mulford	95:36.25	300	
J. Cleary	Bugatti	96:50.40	.....	
Grant and Stricker still on track when race called off.				
25-MILE EVENT				
Bob Burman	Peugeot	21:29.96	\$400	
Ralph De Palma	Stutz	21:31.50	300	
Willie Haupt	Duesenberg	22:01.45	200	
Walter Jones	Peugeot	22:10.85	100	



## Speed Tabulation of 100-Mile Race, Held at Narragansett Park Speedway, Providence, R. I., Sept. 18

Car	Driver	Miles	10	20	30	40	50	60	70	80	90	100
Maxwell.....	Rickenbacher.....		9:04.05	20:44.66	28:39.80	37:53.25	46:20.80	54:55.25	63:22.95	71:43.70	80:10.45	89:24.75
Peugeot.....	Burman.....		9:02.95	18:10.75	27:18.15	36:22.73	46:11.75	55:07.15	63:59.25	72:45.35	81:46.75	91:21.55
Duesenberg.....	Haupt.....		9:27.60	18:43.80	27:54.65	36:52.40	45:54.65	56:11.25	65:09.25	74:06.95	82:58.25	91:24.25
Stutz.....	De Palma.....		9:02.20	18:09.10	27:17.75	36:19.25	46:10.45	55:10.70	64:11.60	73:23.30	82:26.90	91:42.70
Duesenberg.....	Henderson.....		9:05.60	18:11.35	27:19.35	36:28.10	46:06.65	54:54.65	64:07.05	73:15.75	82:23.95	92:25.35
National.....	Myers.....		9:17.95	18:15.95	28:41.60	37:41.53	46:40.30	57:57.60	66:56.35	75:57.20	84:44.60	93:42.50
Mulford.....	Vall.....		9:16.85	18:26.80	28:55.40	38:04.70	47:05.55	56:07.60	66:08.65	75:27.20	86:12.95	95:36.25

would whirl around and the rear wheels would start for the sky or the upper edge of the track only to get yanked back like an unruly horse that shied at a street car.

Then it would roar down the track with the driver laughing and nodding to his pit attendants, who held up blackboards telling him how fast he was going, his position, etc. Having evened up matters it was then his plan to get the lead. De Palma was the first he went after and when he had swung over the line on the 72d mile and the cars tore around the first quarter, Rickenbacher went into second place.

It was now Burman only that separated him from first place. Then the real race began. One hardly realized that the Maxwell had passed when it was around again. It came so fast that people mistook it for some other and they asked where it was, not knowing it passed.

When the cars came whirling down for the 73d mile it was seen that Rickenbacher was closing up on Burman. The latter passed over the line 5 sec. ahead. There was no question then of the outcome, it seemed. On the next lap they tore down side by side and it seemed as if Rickenbacher was playing with Burman. On the next mile they crossed the line with Burman 4 ft. in the lead. For two more laps they swung around side by side and then entering the 77th mile Rickenbacher seemed to infuse new life into his car and shot into first place. When he went over the line on that mile he was 9 sec. ahead of Burman.

Meanwhile De Palma seemed to have lost heart and was slowing up. As they went around on the 80th mile Rickenbacher was close to De Palma and on the next mile had passed him, giving Rickenbacher a full lap lead, thereby making up four laps in about 65 miles.

Meanwhile his lead over Burman increased and at 85 miles he was 27 sec. ahead, which was equal to a little more than

½ mile. The spectators began to expect him to lap Burman then. But when he had gone 90 miles and was about ¾ mile ahead he began to slow down and drive safely. Burman was trying to make up the lost distance, but could not do it.

Willie Haupt then came along and passed De Palma. So as it neared the 100 miles everyone was resigned to Rickenbacher's win. And he crossed the line amid a great ovation, with 1 min. and 1 sec. to spare. Burman finished second, Haupt third and De Palma fourth.

## Burman Wins 25-Mile Race

The 25-mile race was not very interesting. There were eight starters and it proved a jockeying match between Burman and De Palma, neither getting far in the lead at any time. Finally Burman shot over the line 50 ft. ahead of De Palma with Haupt third and Jones fourth. Burman's average was 69.76 m.p.h. for the race. Stops were unofficially given as follows:

Rickenbacher stopped in the 15th mile to adjust carburetor. Lost 2½ min.

Henderson, Duesenberg, 47th mile to change tires.

Vall, Mulford Spl, stopped on the 25th and 60 miles for tires.

LeCain, Pugh Bros. Spl, out in 15th mile with broken clutch.

Cleary, Bugatti, stopped in the 8th, 42, 50 and 75th miles for tires.

Dickenson, Stutz, stopped on 3d, 45th and 75th mile with steering gear trouble that finally put him out of race in last stop.

Myers, National, stopped in 25th and 45th mile for tires.

Stricker, Erwin, stopped in 32d mile for tires and 45th for carburetor trouble.

Grant, Sunbeam, stopped in 42d and 48th miles for spark plug trouble.

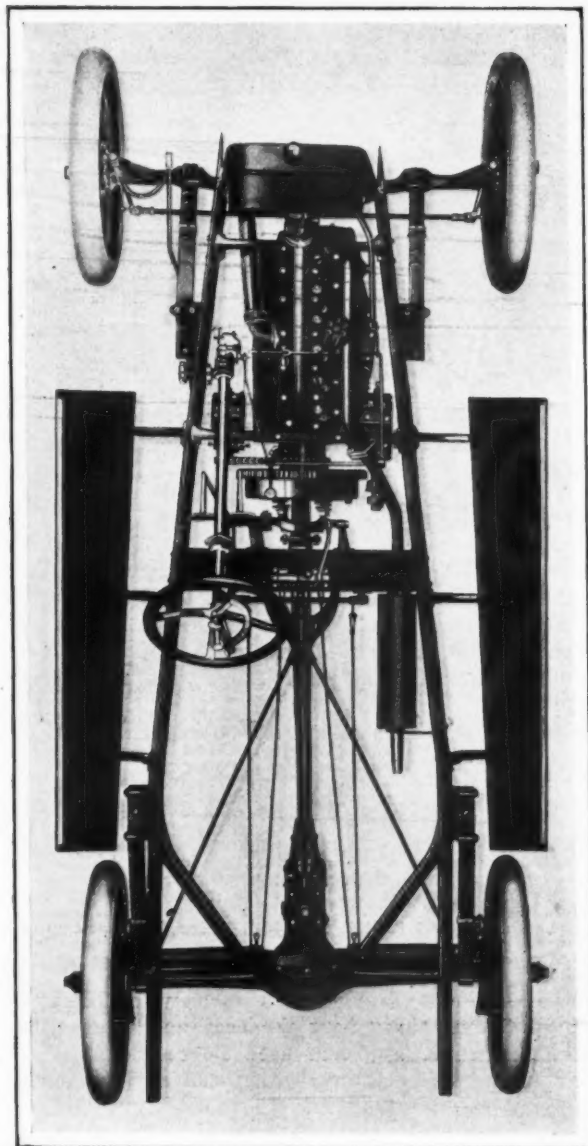
O'Donnell, Duesenberg, stopped on 4th and 13th miles for carburetor trouble that put him out of race on second stop.

Rickenbacher's winning Maxwell and Burman and Haupt's Peugeots used Oilzum throughout the race and practically all the cars except the Sunbeam used Boyce Motometers. Nearly all the cars were equipped with Goodrich Silvertown cord tires.



The Narragansett Park 1-mile asphalt speedway, showing part of the 40,000 people at the opening meet there last Saturday

## Saxon Adds Roadster on Six Chassis



Plan view of the Saxon six chassis for 1916

### Two-Unit Electric Starting and Lighting System Replaces Single-Unit Type on Six— Bodies of Both Four and Six Improved

**T**HE new series Saxons of the Saxon Motor Car Co., Detroit, Mich., will cost the buyer just as much as they did before, but they have a number of improvements and refinements which really make the cars strikingly good values. The little Saxon roadster still commands a figure of \$395, though it is fitted with a three-speed gearset instead of two speeds, and there are other differences such as a much more attractive body line which brings the cowl up to meet the windshield in neat fashion.

The six price is \$785, and besides the touring car model, a very attractive roadster is fitted to the chassis at the same price. Perhaps the most important change in the six is the adoption of a new type of electric starting and lighting system of two-unit form which replaces the single-unit type of the previous series. Besides this, there are a number of body refinements and a few little changes in the mechanical end which lend to the greater efficiency of the vehicle.

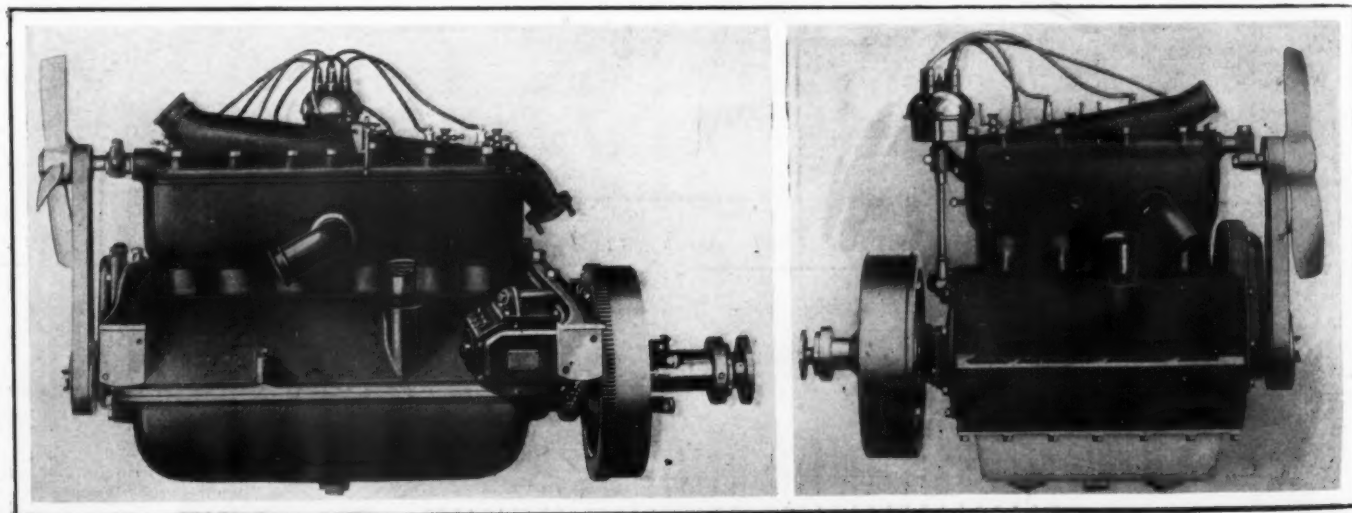
Briefly, the roadster specifications take in a 15-hp., 2¾ by 4-in. motor, a three-speed selective gearset in unit with the rear axle, dry-plate clutch, left steer with center control, wheelbase of 96 in., cantilever springs and 28 by 3 tires.

Reviewing the details of the six, one immediately sees that the characteristic appearance of the car is not changed. It still retains the high, narrow radiator and the nicely-shaped body. The motor has a bore of 2¾ in. and a stroke of 4½ in., and the gearbox is also on the rear axle, which is a three-quarter floating construction. Cantilever springs, dry-disk clutch, wheelbase of 112 in. and 32 by 3½ tires are also among the specification features.

#### The Saxon Six

Taking up the six-cylinder car first, it should be said at the outset that the car enters its second year strikingly free from mechanical changes. This but reflects the soundness of the design in the first place, for it is not to be supposed that a company of the Saxon caliber would stand back for a minute if it were deemed advisable to make any constructional changes other than the minor ones that are to be mentioned in the new series.

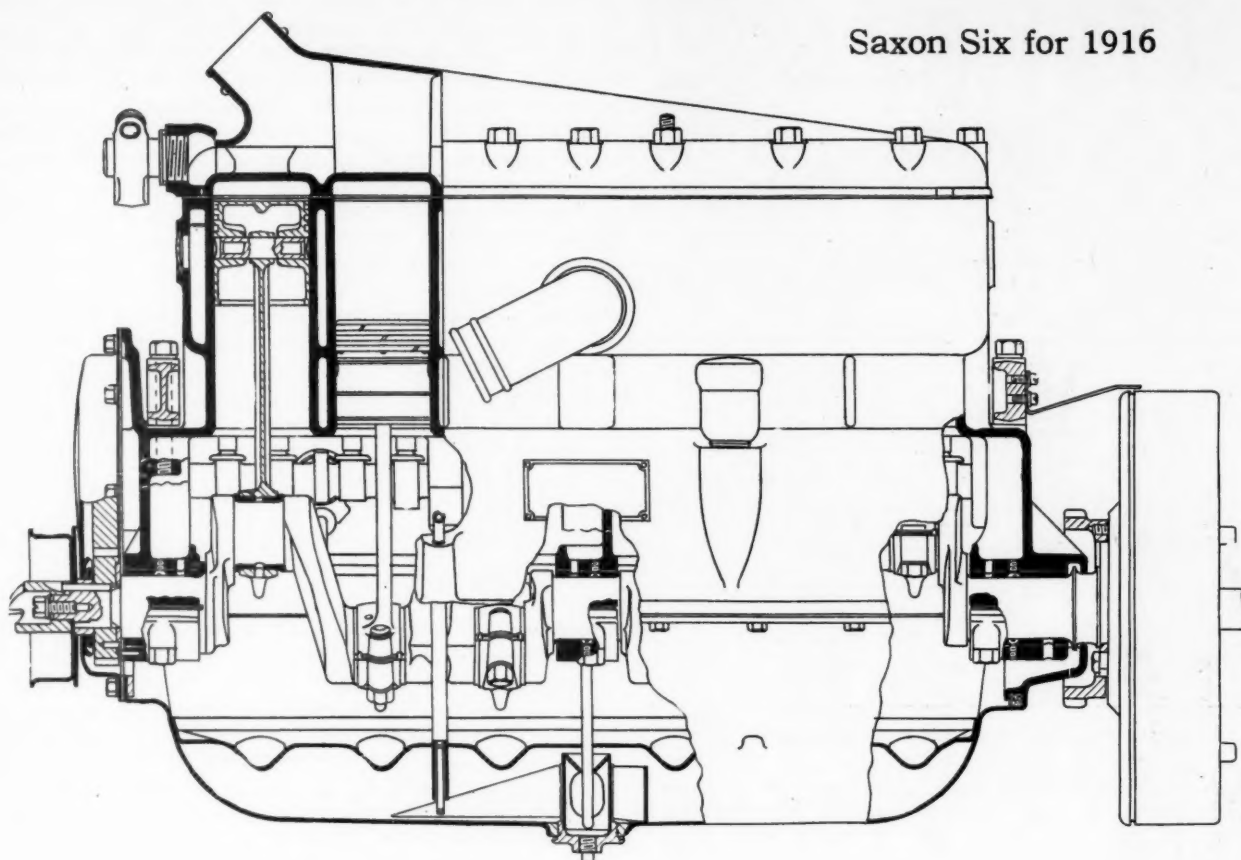
In adding a roadster body to the six chassis, the Saxon company makes a wise move, for there is unquestionably a large field for roadsters of the lighter type, and the chassis adapts itself readily to this



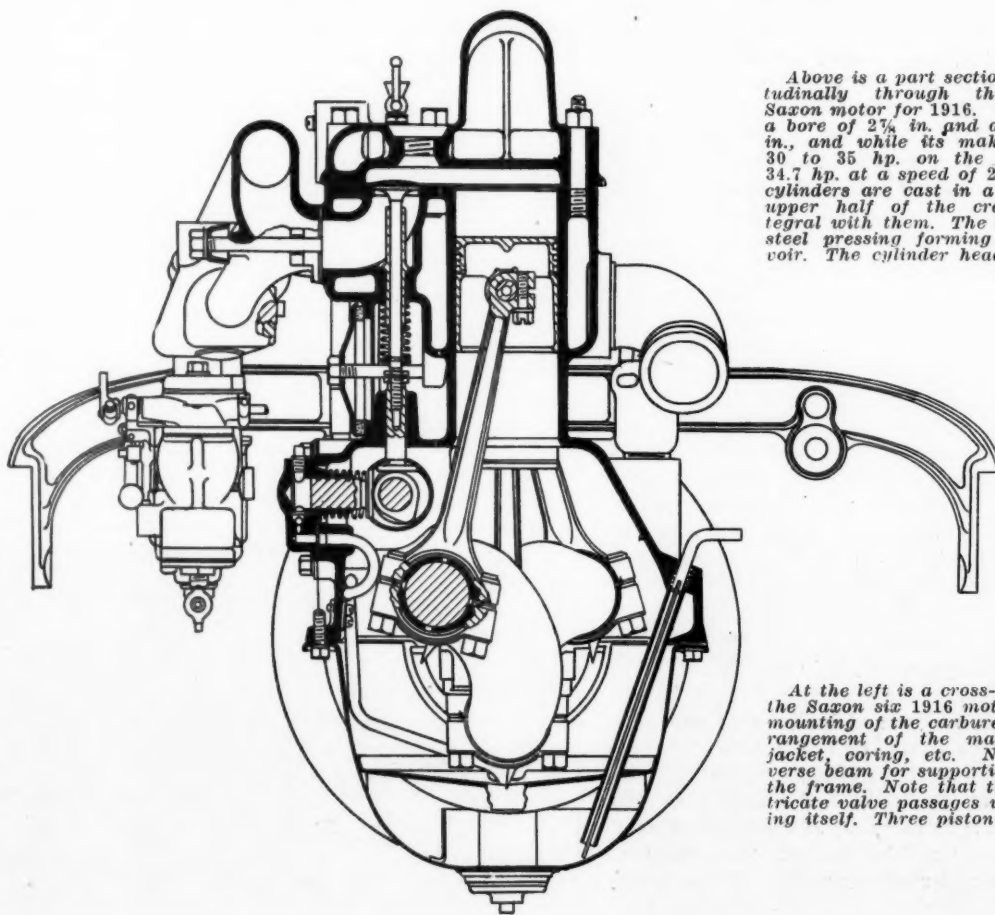
Left—Left side of Saxon six motor showing electric starter. Right—Right side of Saxon four motor



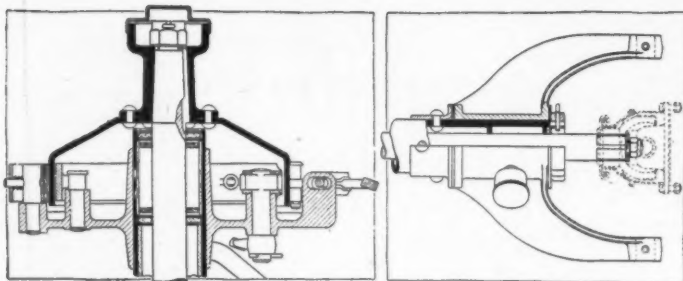
Saxon Six for 1916



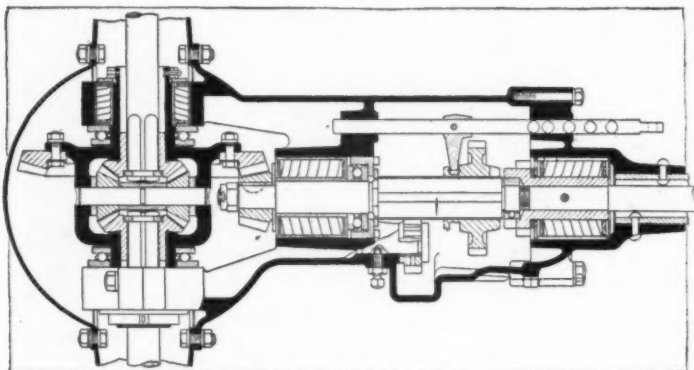
Above is a part sectional view longitudinally through the six-cylinder Saxon motor for 1916. This motor has a bore of  $2\frac{3}{4}$  in. and a stroke of  $4\frac{1}{2}$  in., and while its makers rate it at 30 to 35 hp. on the block it gives 34.7 hp. at a speed of 2200 r.p.m. The cylinders are cast in a block and the upper half of the crankcase is integral with them. The lower half is a steel pressing forming the oil reservoir. The cylinder head is detachable.



At the left is a cross-section through the Saxon six 1916 motor showing the mounting of the carburetor and the arrangement of the manifolds, water-jacket, cooling, etc. Note the transverse beam for supporting the motor in the frame. Note that there are no intricate valve passages within the casting itself. Three piston rings are used.



Left—Characteristic hub of the 1916 Saxon. Right—Yoked front end of the driveshaft torsion tube which hinges to a frame cross member



Rear axle and gearbox in unit with it used on the Saxon four

body without change over the touring car type. A most attractive design of two seater has been evolved—one in which the rear deck is in good proportion to the hood, thus giving a well-balanced effect. Too often body designers make the mistake of dropping the rear deck too abruptly, giving the idea that they simply added a rear deck to cover the rear end of the frame. But Saxon has not made this mistake. The design, in fact, is such that the rear compartment will take a spare tire or two, so commodious is it.

Body sides of the touring car have been raised slightly by the addition of a piece of molding running all the way around the top edge of the body. This is known as a garnish strip, and it does much to add a finishing touch. Tonneau seats have come in for 1 in. of widening, this bringing them to 46½ in. and giving room for three reasonably large persons. To make riding more comfortable in the front seat, the seat back has been given a slightly less vertical position. It tilts to the rear 1 in. more than it did in the previous model. A point which adds to the general good looks is the use of plain upholstery without tufting. That is, the folds run straight instead of diverging to tufting buttons.

The new sixes will also appear in a different standard color. It is a very pleasing shade of olive green—a color known to the paint trade as Cadillac green. This seems to dress the six up in genteel style, and is a welcome relief to the somber deep blues and blacks that are all too prevalent in standard body colorings.

#### Two-Unit Electric System

The chief mechanical change, as already mentioned, is in the adoption of a two-unit electric system. This is the product of the Detroit Starter Co. and both motor and generator are compact and well mounted on the engine. The two units occupy positions on opposite sides at the rear. The starting motor is placed on the right and hangs from the rear motor supporting arm. It connects to the flywheel gear through the Bendix automatic shifting device. The reduction is 10 to 1 between engine and electric motor, and the latter is capable of turning a motor somewhere in the vicinity of 100 r.p.m.

Hung off the left rear motor supporting arm, the generator

is chain driven from the crankshaft. This drive is just between the flywheel and the rear of the engine. To afford adjustment of the chain and to make a simple mounting of the electric unit, a trunnion construction is used. A plate on the top of the generator fits into a trunnion pin attached to the supporting arm, and the generator can be rocked closer to or away from the engine to give the required adjustment of the sprocket centers. Two set screws hold the generator in place. The generator runs at twice engine speed.

Charging regulation is obtained by the use of a Ward Leonard regulator which cuts in at 10 m.p.h., and holds the charging rate at a prescribed maximum regardless of the engine speed.

Saxon axle equipment is now made by the Timken company, and has been for several months. However, the present axles are of practically the same design as they were formerly, although a notable change made some time ago was the adoption of spiral-bevel gears in the rear axle. There is no longer any doubt of the efficiency or noise eliminating features of this very modern form of gearing, and further dilation upon it would be useless here.

#### 34.7 Hp. at 2200 R.P.M.

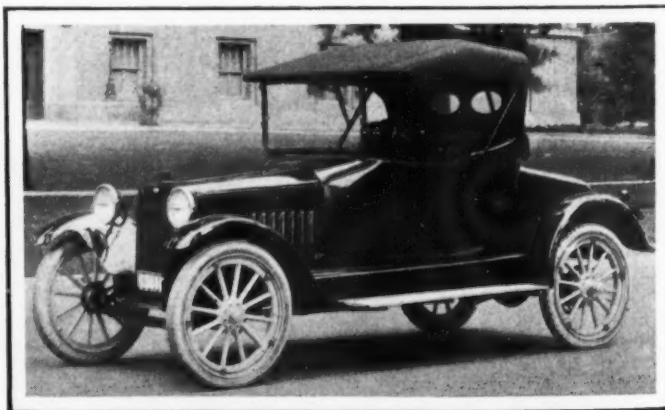
On the block the six-cylinder motor gives 34.7 hp. at a speed of 2200 r.p.m. Its advertised rating is from 30 to 35 hp., so that it does all that is claimed for it. At first glance, the most noticeable thing about this power unit is the compactness. The cylinders are cast in a block, and the upper half of the crankcase is integral with them. The lower half, which also forms the oil reservoir, is a steel pressing, which is light and smooth of form. The cylinder head is detachable, bolting by a number of heavy studs to the cylinders proper, and incorporating as an integral part the large water outlet connection to the radiator.

Valves are on the right, having the usual complete inclosure against dirt and noise. On this side are also both manifolds which are separate castings bolting to the block. A simple cylinder casting is therefore obtained, as there are no intricate valve passages within the casting itself. The Rayfield carburetor is positioned at about the center of this side of the engine so that it is readily accessible.

Interior features offer nothing out of the ordinary for good practice. Valves have nickel-steel heads welded to carbon steel stems. Pistons and rings are standard, and a slight change this year is the substitution of a Burd high-compression ring at the top of each piston for the former eccentric ring. The other two rings for each piston, however, remain of the eccentric type. Four bearings support the camshaft, the drive for which is by helical gearing, and there are three main bearings for the crankshaft. Bearing dimensions follow:

Front main .....	1 7-8 by 1 1-2
Center main .....	1 7-8 by 1 7-8
Rear main .....	1 7-8 by 3
Connecting-rod lower ends.....	1 7-8 by 1 1-2

(The first dimension is the diameter.)



New Saxon six roadster which lists at \$785 with complete equipment



Atwater Kent distributor ignition is employed, and there is one slight change in connection with it. That is the moving of the spark plugs from over the exhaust valves and placing them over the intakes. This was done to give the plugs longer life and keep them cleaner. The exhaust gases sweeping by the plugs subject them to greater heat than they have to undergo over the intakes.

Splash lubrication finds good application in this motor. There are individual splash troughs under the rods, and circulation is maintained by a pump, with leads to the main bearings. Cooling is also very simple through the use of the thermo-syphon system in connection with a cellular-type radiator and belt-driven fan.

#### Rear-Axle Gearbox

Continuing back of the power unit, the car possesses a multiple dry-disk clutch, alternate disks being steel against Raybestos. This clutch is housed in the flywheel. There are two engagement springs, making for uniform action. Then, after passing through a universal, the drive shaft enters a torsion tube. This has the usual yoked front end, hinging to a substantial frame cross member. At its rear end the tube attaches to the front of the gearbox, and the latter in turn is a unit with the front part of the rear axle housing. Diagonal brace rods run from the outer ends of the axle housing to the front of the torsion tube.

In this design of attaching gearset to rear axle, a compact form of gearbox is used, this of the three-speed selective type. The shifting rods run along the top of the torsion tube from the gearshifting levers.

The Saxon company has been very successful with cantilever springs, these being used on both cars. They are constructed of vanadium steel, and are mounted outside of the frame rails on riveted brackets. These springs are 2 in. wide, 30 in. long in the rear and 27 1/4 in. in front on the six.

Of rather unusual form is the frame, which has a straight taper from a point a little forward of the rear axle. This is done to bring it to a narrow front and to offer a good support the entire length of the body.

#### The Saxon Four

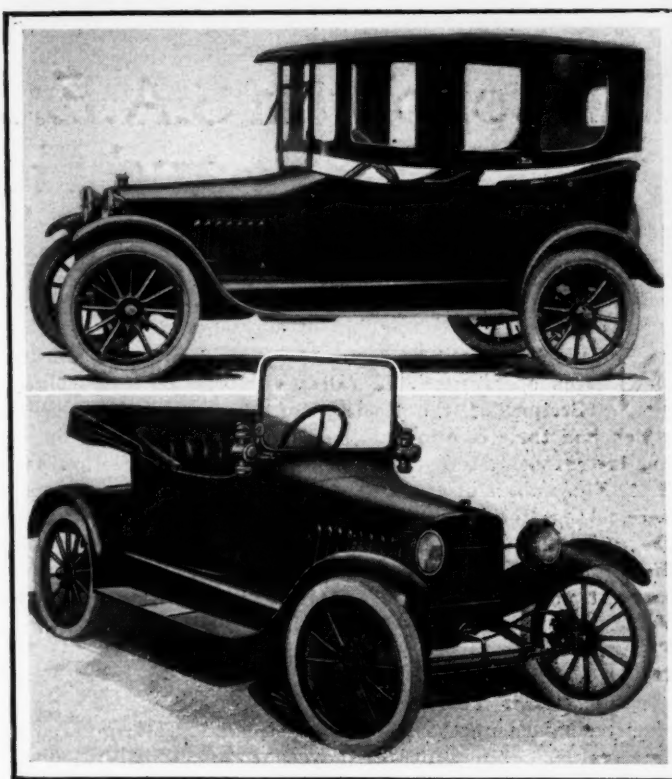
Flexibility of the little Saxon roadster and better ability for negotiating all sorts of going is given by the addition of the intermediate speed in the gearset. In the previous models, there was no speed between low and high, and the change will be appreciated.

The noticeable thing about the new roadster, however, is the change in the front part. The former windshield filler skirt has been entirely done away with. This was a piece of cloth used to bridge the gap between top of cowl and bottom of windshield. The new body cowl is brought up to meet the windshield without break, and it adds a nice touch. Along with this improvement, the windshield itself has been enlarged and made ventilating. That is, it is hinged to swing either way, and when the top is swung outward, there is some space below for air to sweep in.

Although electric starting and lighting are not standard on this car, the cost of equipping it with a single-unit Detroit Starter Co. system has been cut from \$70 to \$50 extra. This means that a full electric-equipped vehicle may be had for \$445. However, instead of having only gas headlamps as the standard lighting equipment, oil side lamps have also been added, these in addition to the acetylene lights at the front of the radiator.

Another refinement is the fitting of adjustable clutch and brake pedals so that a driver of any height may be comfortably accommodated. The brakes have also been improved by making them 2 in. wide instead of 1 1/2 in. This gives added braking power on the 8-in. drums.

As in the six, the axles are now made by Timken though of the same design as in the past, except that the front wheel



Above—Saxon six touring car with detachable inclosed top which sells for \$935, including the touring car top as well as the demountable type illustrated. This car sells for \$785 without the demountable top. Below—The new Saxon four-cylinder roadster which, with three-speed transmission, larger body, adjustable pedals and other refinements, sells for \$395

spindles have been changed to a better steel. They are now a chrome-nickel steel, whereas they used to be constructed of 15-20 carbon steel.

In the tire equipment, although the size remains the same as last year, the tires are really better for instead of using motorcycle tires, the Goodyear factory is furnishing a strictly automobile design of tire. The main difference between them is that the tread is heavier, this spelling longer wear.

#### Motor Similar to Six in Design

There are no motor changes other than the fitting of a Burd ring at the top of each piston instead of an eccentric ring, as is also done in the six. Though smaller, the motor is much the same in general design as the six. It is a block type with cylinders and upper crankcase in unit. The head is detachable and also carries a large water outlet for the thermo-syphon cooling system.

Ignition is by Atwater Kent, with the distributor vertically placed at the rear of the motor cylinders. A Mayer carbureter is used, the supply tank being in the cowl. Similar to the six, the engine is oiled by splash, with a pump supplying the troughs and the main bearings.

In the chassis, the design follows closely the recognized Saxon practice, with concentric torque tube inclosing the drive shaft, and with the gearset mounted as a unit with it and the rear axle. The latter is semi-floating, having a pressed steel housing.

Following the popular trend, Saxon has added detachable tops to its line. These are intended for fitting to either the four-cylinder roadster or the six-cylinder touring car. They virtually inclose the car against any kind of weather, and a good scheme of attachment by bolts and catches is employed. The front fits the side supports of the windshield snugly. For the touring car, this top costs \$150 extra when bought with the car, and for the roadster the price is \$60 additional.

# Metropolitan S.A.E. Discusses Aeroplanes and Governors

Paper by Leon Goldmerstein Traces Development of Aeroplanes—Final Report of Research Committee on Governors

NEW YORK CITY, Sept. 17—Fine attendance marked the opening of the fall season of the Metropolitan Section of the Society of Automobile Engineers which had their meeting at the Engineering Society's building last night. More than 100 members of the section and S. A. E. members of the Metropolitan district were in attendance to hear the interesting program made up by a paper on the aeroplane by Leon Goldmerstein, M.A., M.E., and the final report of the Research Committee on Governors presented by chairman H. G. McComb, engineer of the General Vehicle Co. The other members of the committee are, C. W. Fletcher, vice-president Walter Motor Truck Co., and A. M. Wolf.

The report of the Research Committee on Governors completely summed up the activities of this body and marked a very valuable study of the governor as applied to automobiles. The report completely classifies and discusses the various types and thoroughly covers the patent situation of this device. The paper on the aeroplane was one which was well calculated to interest the engineers as it completely treated of the development of this art up to its present stages.

Mr. Goldmerstein prefaced his lecture by pointing out the growing similarity in the aims and work of automobile and aeroplane engineers. He then gave figures to show the enormous progress of the aeroplane industry caused by the war in Europe. Up to the present time this progress had not been accompanied by as careful a study of aeronautics as a science as could be desired, especially in this country. In Europe, although the manufacturing resources are perhaps not so great as in America, much more laboratory work has been done. The war has shown that the most useful type of aeroplane was one capable of carrying a crew of two to six men and a large load of bombs for attack. The recently completed Canada aeroplane made by the Curtiss company for the Allied forces which carried a load of 1 ton and attained a speed of 95 m.p.h. was mentioned as a good example.

The theory of the aeroplane was then dealt with by Mr. Goldmerstein with the aid of diagrams and some mathematical formulae which the lecturer assured his audience

were very simple. It was shown that a single flat plane is not stable owing to the non-coincidence of the center of gravity and the center of pressure, causing a turning moment which upsets the plane. In the aeroplane this is overcome by placing another plane, forming the tail plane, at some distance behind the front plane, the effect of which is to cause the machine as a whole to maintain a definite relation to the line of travel by providing a turning moment about the center of gravity of the aeroplane. If the tail tends to drop its lifting power is automatically increased and the resultant lift brings the main plane back into its most useful position, or angle of incidence.

## Report on Governors

The report of the Metropolitan Section Research Committee on Governors follows:

In considering the subject of governors for internal combustion engines, we might first mention the reason for their existence. Everyone to-day is familiar with characteristics of the internal combustion engine as applied to the automobile. One of these characteristics is that when the load is released from an engine the speed of the engine increases. This increase is limited practically by the size of the valves and other parts used in handling the fuel.

The governor reduces the maximum speed of the engine as limited by its valves and gas passages.

In the earlier days of the automobile the governor was much in vogue on pleasure car motors. To-day its use is ordinarily limited to the motor truck. This is, perhaps, due to two causes: the marked tendency to remove from the pleasure car every part that does not add to luxury, and the necessity, on account of maintenance costs, to limit the speed of the motor truck. It is also worthy of note that the pleasure car is usually driven by the owner, or in his presence, while the motor truck driver is usually outside of his direct control.

The governing of engines is an old art. Everyone is familiar with the flyball type of governor that limits the speed of the steam engine.

For the governing of the internal combustion engine various classes or types of governors have been employed. We may list these as follows:

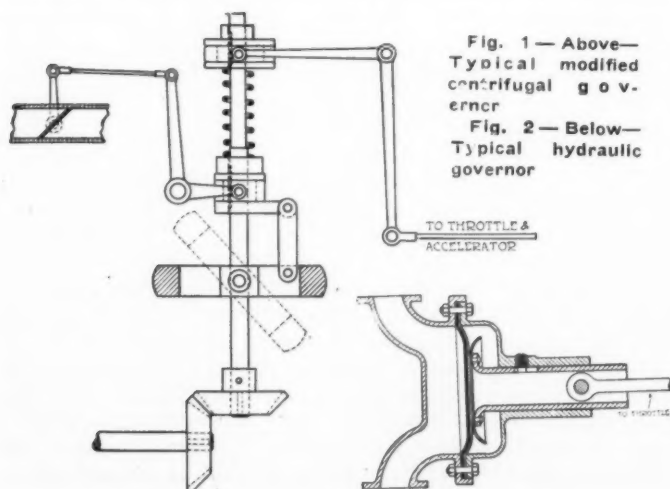
- (1) Hit or miss—Keeping inlet valve closed or exhaust open and so causing engine to miss one or more power strokes.
- (2) Inlet valve control—Varying time of the opening or closing of the inlet valve.
- (3) Ignition control—Omitting the ignition spark.
- (4) Quality of fuel—Lean or rich charge.
- (5) Quantity of fuel—Throttling the charge.

It is interesting to briefly consider the various types that are *not* used on automobile engines.

The hit or miss type probably came into existence on account of the low cost of construction of the governing mechanism. In this class the governor is usually nothing more than a pendulum provided with a trigger or catch that swings on the valve operating rod and hits or misses the end of the valve stem in accordance with engine speed.

The inlet valve control is a promising type but involves high cost and complication.

The ignition control type can be made cheaply but its use involves a waste of fuel in the unexploded charges, and the regulation, of course, is not close.





The quality of fuel control is too delicate a type for ordinary use.

This leaves us then only the quantity of fuel type for consideration in automobile practice. It should not be understood, however, that none of the other types are desirable, but simply that the quantity of fuel type has been the choice for development.

The quantity of fuel type controls by throttling the fuel supply after the fashion used on the cheaper steam engines in throttling the steam on its way to the engine. In the automobile this throttling is usually accomplished by a damper or other balanced valve placed in the intake pipe.

The function of the governor is to limit the motor to some determined and fixed speed.

#### Governor Limits

The governor may operate in relation either to

- (1) The speed of the engine, or
- (2) The speed of the vehicle.

In the engine speed limit type, racing of the engine is prevented. Its maximum speed is fixed. This naturally limits the horsepower output of the motor to that obtainable at the predetermined speed.

In the second type of governor where the speed of the vehicle determines the governed speed of the engine, the full output of horsepower of the engine may be obtained for low gear work when it is desirable, or even necessary, for the sake of expediency, that the engine be forced to do its utmost.

In one device on the market these two control methods have been combined.

In considering the variations of governors we come to a classification of types of quantity of fuel governors.

These governors may be subdivided into four classes, determined by the method of operation—these classes are:

- (1) Centrifugal.
- (2) Hydraulic.
- (3) Inherent design.
- (4) Gas velocity in intake.

#### The Centrifugal

The centrifugal governor, as generally used, consists of two oppositely disposed weights carried upon a revolving shaft, the speed of which bears a direct relation to the speed of the motor. These weights are mounted upon bell cranks, and, as the speed fluctuates, the bell cranks slide a splined sleeve axially along the revolving shaft against spring pressure. The motion of the splined sleeve is then communicated by suitable mechanism, to the throttle.

For the governor to be effective the throttle control mechanism must be arranged so that the driver is given only a limited control by means of the throttle lever, except in special cases where the governor is used only for holding the motor at *any* desired speed.

In all ordinary cases the governor has the master control, as it were. This is readily accomplished by a slotted link.

A typical flyball governor, with horizontal axis is shown in Fig. 3, while Fig. 7 shows the method of connecting the governor with the throttle. This is the governor used on the German Daimler truck.

#### The Hydraulic

In a modification of the typical centrifugal governor a steel ring, so supported that it can rock in relation to the shaft which drives it, is normally held at an angle with the shaft by a spring. As the shaft speeds up the governor ring tends to assume a position concentric with and at right angles to the axis of the shaft. Through the usual splined sleeve and trunnion the movement is conveyed to the throttle.

A typical governor of this kind is shown in Fig. 1, which is that used on the earlier Cadillacs.

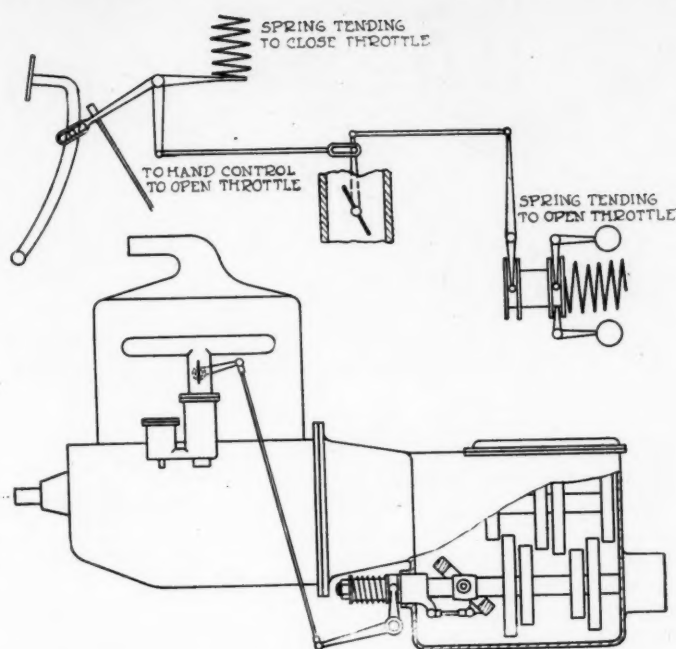


Fig. 3—Above—Flyball governor with horizontal axis  
Fig. 4—Below—Governor drive from transmission shafting

The hydraulic type of governor utilizes fluid pressure from the water circulating or other system where the pressure is in relation to motor speed. The usual form consists of a large diaphragm, one side of which receives pressure from the pumped water of the cooling system, while a rod fixed in a washer or plate on the other side transmits the movement to the throttle. A typical hydraulic governor is shown in Fig. 2. This governor was, until recently, used by Packard, and has been a feature also of Panhard design.

#### Inherent Design

Since every motor has, from its inherent design, a limiting speed, it is apparent that this limiting speed can, by design, be made the governing speed desired. This is done, in its most simple form, by making the intake passages small.

As yet this means of motor control has not been utilized to any extent.

#### Gas Velocity

The kinetic energy of the gas in the inlet manifold is utilized to operate a type of governor that is extremely simple in its design and operation. An example of this type is marketed as the Kramer. In this governor a disk is placed in a funnel shaped section of the main gas passage. This disk is held in normal position by a spring. When the gas velocity reaches a predetermined speed the spring tension is such that the disk is drawn toward the small end of the funnel tube, and by suitable connections with the balanced throttle, the gas supply is limited.

#### Vehicle Speed Limit Type

We next shall pass to that type of governor where the motor speed limit is set by the speed of the vehicle. This method of control, as before mentioned, permits the engine to run at higher than the normally governed speed, when the vehicle is being operated on any of the gears but high. The reason for this is obvious; more power for the emergency pull on low gear. The governing means is essentially the same as designed for incorporating in the motor, but with the important difference that it receives its drive from the wheels or some part that runs in relation to car speed. In one form the governor drive is from the front wheels, Fig. 5, while in another the drive is from the transmission, Fig. 4.

It has been said that the governor might limit in proportion to engine speed or that it might limit in proportion to

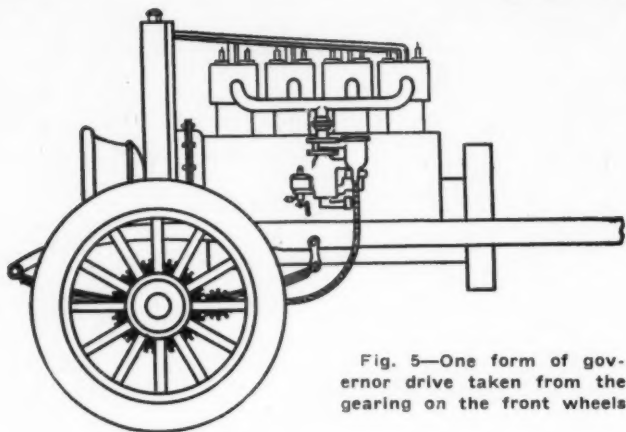


Fig. 5—One form of governor drive taken from the gearing on the front wheels

vehicle speed. One of the most interesting developments is the governor that limits in proportion to both.

In this ingeniously designed governor, shown in Fig. 8, there are two operating shafts. One of these shafts is driven by the motor and the other is driven from a part that rotates in proportion to vehicle speed, such, for example, as the propeller shaft. The shaft which is going at the higher speed, controls the motor, but the gear ratio between the engine and governor is so arranged that on direct drive the vehicle speed operates the governor connection from the motor. In other words, on direct drive, the ratio with the propeller shaft, for example, may be such that when the propeller shaft is going 800 r.p.m., the governor may be going 1000, and as it controls the motor at this point the motor is really governed to 800 r.p.m. However, the ratio between the motor and governor may be so arranged that the motor speed would have to be 1500 r.p.m. before the governor reached the critical speed of 1000 r.p.m.

It will be seen that through this method of governing, while the maximum speed of the car is limited on the top gear and the engine governed in proportion, should the driving become difficult on account of hills or heavy road resistance—in other words, should road conditions so change as to necessitate using some of the lower gears, the governed limit of the motor is raised so that the motor can be permitted to develop its full horsepower.

In this governor a grid type of throttle is used in which the openings are proportional to the angular movement of the throttle axis and in which only a small angular movement is necessary to completely close the throttle.

Another scheme to accomplish the same result forms the basis of a patent granted to H. Saurer. In this governor an auxiliary spring, operating in relation to the gear shift, augments the governor spring when the gear shift is in certain positions. This is shown very completely in the patent office drawing of the Saurer patent No. 13,348. The purpose of the Saurer scheme is to decrease the engine speed when the vehicle is traveling on its top gear, but to allow the engine speed to be increased when the lower gears are employed. This, it will be noted, is done by means of a cam fixed to the gear shift shaft. This cam also has provision for reducing the motor speed when gears are in neutral. This is one of the most interesting types of governing mechanism.

That the governor is, at present, deemed of importance for commercial vehicle work, is indicated by an examination of the Statistics of 1915 Commercial Cars, as issued in a booklet by *The Commercial Vehicle*. Here it is found that 74 per cent of the commercial vehicles are provided with governors, which leaves only 26 per cent ungoverned. Of 142 different makes of commercial cars, with 377 different models, 279 of these have governors as follows:

Of the centrifugal type.....	238
Of the hydraulic type.....	5
Of the inherent design type.....	5
Gas velocity in intake.....	34

Through the kind co-operation of the Institute of Automobile Engineers of England, information was secured relative to English practice. Here the proportion of non-governed to governed motors was more nearly even than in America. However, this is, perhaps, traceable to better disciplined truck drivers.

Without doubt, at the present, a consensus of opinion calls for governors on the engines of motor trucks.

#### Governor Drive, Etc.

In connection with this subject, it is interesting to note a few of the different types of drives that are used to communicate the movement of the rotating part to the governor mechanism. In some cases, particularly where the governor is to be applied to an engine made by the builders of vehicle units, but not applied as standard, the flexible cable is in vogue.

In those types of construction where the governor is built integral with the motor we find a sturdy and simple mechanism comprising suitable bell cranks, levers and rods connecting the sliding sleeve of the governor unit with the throttle.

The governor is usually so designed that it is impossible for the driver to tamper, in any way, with its operation.

An excellent example of sealed-in governor connections is the type used on the Packard.

If we refer again to Fig. 7, we will see how the governor is given the master control through the slotted link, which permits the driver to open up the motor without, however, taking it beyond the control of the governor, since it will be noted that the flying out of the governor weights exerts a positive control of the throttle lever, which is entirely beyond control by the driver, since the slot in the slotted link is made of sufficient length to give the governor full range and thereby full control.

#### Positions of Springs Interesting

In relation to other details, the position of governor springs is of interest. In some designs the governor spring is arranged so that it presses against the splined sleeve that operates the governor mechanism, the spring being arranged concentric with the shaft on which the splined sleeve is fitted. This is well illustrated in Fig. 3.

In other less used types of mechanism, the governor spring operates on the end of a lever connected with the trunnion carrying the governor weights. In the Kramer governor the spring is of the spiral or clock type.

In still another type the springs act directly on the governor weights. This is clearly shown in Fig. 6.

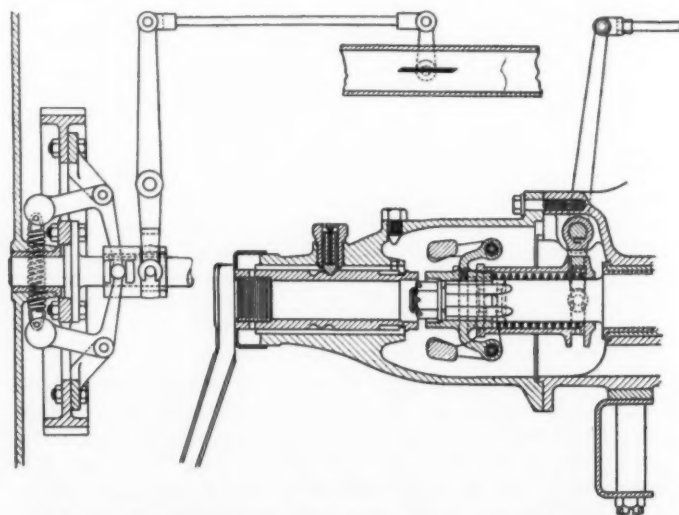


Fig. 6—Left—Type which has the springs acting directly on the governor weights

Fig. 7—Right—Method of connecting the governor with the throttle, as used on the German Daimler



In most of the commercial governors now on the market, the governor spring is made adjustable by means of a threaded sleeve and this sleeve is provided with a locking means, so that after the desired governor adjustment is obtained, the governor mechanism may be locked either by seal or padlock.

It is the usual practice to have the truck guarantee become void if governor seals have been tampered with.

In other forms of governors, like the German Daimler, the governor spring is housed in an extremely inaccessible box. To get the necessary adjustment, the governor spring is ground to length when the motor is tested. In this case the governed speed is fixed once and for all. Another interesting detail refers to various methods of connecting the governor and throttle. In automobile practice direct connections are used, but an examination of the patent art shows that besides the bell crank and rod methods of connection, or connections by flexible cable, electrical and pneumatic means may be used.

#### Patents

In connection with this report, a collection has been made of the United States Patents on the subject of governors. These patents will be found on file with this report.

Most of these, fortunately, do not touch the automobile.

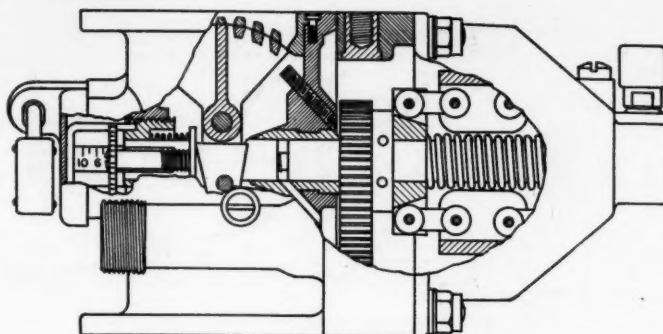


Fig. 8—Diagrammatic section of the governor with two operating shafts, one shaft being driven in proportion to the vehicle speed and the other by the motor

However, they are of interest in showing the work attempted on governor design. These patents are found under Class 123, in the United States Patent Office, and under this class we list various interesting patents under sub-classes.

In addition to United States patents, we have obtained, through the courtesy of August Riebe of the Riebe Ball Bearing Co. a list of German patents.

A complete list of United States and foreign patents then followed in the report.

## Recent Court Decisions—Sale on Instalments

By George F. Kaiser

**A** MASSACHUSETTS contract to sell an automobile on instalments allowed title to the car to remain in the vendor. The seller also had the right to take possession of the car on default in any of the terms of the contract. A default was made, and 2 days afterwards a replevin action was started for possession of the car against a deputy sheriff, who had attached it.

The court decided that the seller was entitled to possession of the car as against the vendee creditors, who were claimants under the attachment, because the contract had been made, and was to be performed in Massachusetts, although the case was tried in Maine, and no Massachusetts statute had been put in evidence to show that in a case like this the seller was required to give notice to the attaching party before beginning suit, and one who relies on a foreign statute must prove it.

In this case on neglect to prove the Massachusetts statute, the common law rule applied, under which no notice was required.—*Franklin Motor Car Co. vs. Hamilton*, 92 Atlantic (Maine) 1001.

#### Allow Automobile to Pass

That an automobile, when overtaken from the rear, must allow the approaching automobile to pass, was recently decided in New York.

A suit was instituted for damages arising out of a collision between two automobiles. The party bringing the suit claiming that she had been driving her car on the extreme right of a public highway, 20 or 25 feet wide, at the rate of 15 miles per hour. That the left front hub of her car had been struck by the right rear wheel of another automobile coming up at the speed of 30 miles per hour without any warning. The other motorist claimed, however, that the first car was to the left of the center of the road; that for a considerable time he had been driving in its dust, and finally, desiring to go ahead, he sounded his horn when he was about 200 feet in the rear, and continued to sound it until he had overtaken the car in front; that there was barely room to pass even leaving the road and scraping the stone wall at the side.

That plaintiff, instead of yielding the road, edged over further beyond the center, and caused the collision.

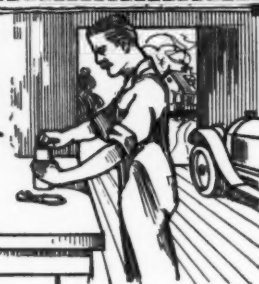
The jury accepted the latter statement as regards the accident, and the court said that "if the position of the forward car in the center of the highway did not leave sufficient room for passage, upon request or equivalent notice, if practicable and safe, it should have been turned aside so as to leave sufficient room for passage. Relief was therefore denied the party bringing suit.—*Gautier vs. Lange*, 151 N. Y. Supp. (N. Y.) 902.

#### One Must Give Way

The decision in a recent New York case was that when each of two parties relies on the other's giving way both are guilty of contributory negligence and are barred from recovering for injuries resulting from a collision. Suit was brought by a motorist for damages claimed because of a collision between a trolley car and an automobile truck. The question of negligence and contributory negligence was emphasized by the court when it was found that neither the motorman nor the chauffeur attempted to stop his vehicle, the chauffeur and his helper testified that they had started the automobile truck on 133rd street, west of Madison avenue, and that they intended going south on the avenue. That when 7 or 8 yards from the crossing they saw a car approaching about 30 yards south of 134th street; that the helper put up his hand for the car to stop but the car struck the truck's front spring and scraped by in front of it; that they had blown their horn but did not slow down or stop until they saw that the motorman was not going to stop.

The court held that in view of the fact that neither party had right of way over the other, but that both had equal rights on the highway, it was as much the chauffeur's duty to avoid a collision as it was the duty of the man in charge of the trolley, and that therefore the trolley company was not responsible to the automobile truck owner for the damages.—*James Everard's Breweries vs. New York Railways Co.*, 151 N. Y. Supp. (N. Y.) 905.

# The Rostrum



## Sheldon Makes Only Semi-Floating Axles

**EDITOR THE AUTOMOBILE:**—In your issue for September 9, beginning on page 472 was a story entitled Axle Design for Accessibility and Strength, in which illustrations were shown of various makes of axles including a panel of Sheldon rear axles. The illustrations of the Sheldon type of construction showed semi-floating, three-quarter floating and floating, giving the impression that the Sheldon Axle & Spring Co. is still producing three-quarter and floating types of axles.

The information concerning the Sheldon products and blueprints from which the illustrations were made were sent to you by the writer in answer to your request for information concerning typical methods of constructing these three types of axles and insofar as being illustrations of those three types is concerned the matter is accurate.

The illustrations of the three-quarter and floating types are illustrations purely of types that have not been manufactured in the Sheldon plant for some time. As you undoubtedly are aware, the Sheldon company is convinced of the unquestioned supremacy of the semi-floating type of axle as evidenced by the fact that no type other than the semi-floating is being manufactured by it. In view of the fact that we are convinced of the superiority of the semi-floating type and are true to our convictions to the extent of not manufacturing any other type we certainly will appreciate the publication of this communication so that there may be no confusion in the minds of your readers concerning our adherence exclusively to the semi-floating type of construction.

Wilkes-Barre, Pa.

ARTHUR M. LAYCOCK,

Chief Engineer, Sheldon Axle & Spring Co.

—This article was in no way descriptive of the product of any manufacturer and must not be construed to mean that the axles shown are the present products of any of these. In fact, some of the illustrations were merely diagrammatic. The illustration showing the Timken, for instance, was of a diagrammatic nature and included a three-quarter floating type which this concern does not make.

### Wants Owners' Fuel Consumption Tests

**EDITOR THE AUTOMOBILE:**—Some weeks ago you had an article in your magazine commenting on the unfair gasoline consumption tests as advertised by certain automobile manufacturing companies. You suggested some definite standard by which all tests might be made, but why not get actual road tests?

I have had my new Studebaker four-cylinder car now for some nine weeks, have traveled 2865 miles and consumed 148 gal. of gasoline. At 1408 miles I used 70 gal.; at 1800 miles just 90 gal. From that time on I began to go with a full car (five passengers) and consequently the average began to drop.

It seems to me such tests are of much more value to the average motorist than any track test by experts can possibly be.

The new 1916 cars are frequently reported as making certain mileages on special trips but no 3000-mile average can be staged by the average owner very often.

Would like to hear of tests similar to mine from different car owners.

Melrose, Mass.

H. M.

### Lost Motion in Pinion and Gear

**EDITOR THE AUTOMOBILE:**—Kindly explain by sketch and description the proper way to find out if there is any lost motion between the driving pinion and crown gear?

2—Between compensating gears and spider gears?

3—Kindly explain the proper way to find out if the driving pinion has sheered its key.

New York City.

J. D.

—This can be explained better than illustrated. The best way is to remove the cover plate from the differential housing and clean off the gears so that the action in the assembly can be noted. Leave both wheels on the ground and place the gearshift lever in neutral. By means of a pipe wrench a firm hold should be taken on the propeller shaft and with the hand on the large crown gear, the propeller shaft moved backward and forward. Any lost motion between the shaft and the crown gear can then be readily noted.

2—Any play in the differential assembly at any point can be located by removing the assembly from the housing and examining the gears, by shaking them back and forth.

3—If the driving pinion has sheered its key this can be readily determined by the fact that with the gears in neutral, the propeller shaft can be rotated by means of a pipe wrench without moving the rear wheels or the differential.

### Remedying Grinding in Differential

**EDITOR THE AUTOMOBILE:**—Kindly advise me how I can eliminate a grinding noise occurring in the differential on an Overland 1910 model 51.

Would like to know just how to adjust this so that I will not have to buy new gears.

Anna, Ohio.

O. E. H.

—The grinding noise you speak of may be due to foreign matter which has accumulated in the differential gear housing. Before doing anything else, it would be well to flush this out with kerosene. The differential can then be packed with heavy grease and unless the noise is due to considerable wear, it should not bother you. The probabilities are that the wear occurs between the driving pinion and the crown gear. Any adjustments at this point should be made by a repairman who is expert in the work, as it is very delicate. On the Overland rear axle, the mesh between the bevel gear and drive pinion can be accomplished by removing the cover from the differential housing and taking off with a screwdriver the thrust bearing adjustment lock on the side toward which the differential is to be moved. The adjustment cup of the thrust bearing is then turned in the same direction. The two screws which hold the split differential adjusting collar are turned until the collar may be evenly moved in the desired direction. Moving the collar on one side of the differential makes it necessary to adjust the one on the opposite side accordingly. Both axle shaft ends have right threads.



When the proper mesh of the gears is obtained, both collars are tightened, and the thrust bearings brought close to the adjusting collars. All the screws are then tightened and the small locks which keep the cups from turning are replaced.

### Carburetor Is Improperly Adjusted

Editor THE AUTOMOBILE:—What are some of the best carburetors for the Ford 1913? I have a Holley and am not getting sufficient power.

2—I would also like to know whether dry cells are practicable for lighting the Ford? I hesitate about running the lights from the magneto.

3—My motor runs well until I strike a steep hill and have to open the throttle wide, then the engine seems to choke, and skipping follows. The throttle is situated so that the engine idles smoothly when the throttle is closed. It is not a question of mixture, at least when the throttle is not opened much, for I have tried different adjustments of the mixture needle.

Hartford, Conn.

H. H. B.

—The Holley carburetor should give you perfect satisfaction on the Ford car and if you are not getting sufficient power it is because the adjustment is not correct or because some part of the carburetor or motor is out of order. It is suggested that you have the carbon cleaned out and the valves ground if this has not been done for some time.

2—Dry cells are not practicable for lighting a Ford car as they would have to be renewed every time the current was consumed.

3—You are not getting enough air at full throttle opening and you should change the carburetor adjustment to correct this fault.

### Forcing Apart Split Demountable Rims

Editor THE AUTOMOBILE:—I have found a jack and convenient rock a most efficient device for forcing the ends of a split demountable apart so that the retaining lock could be dropped over the pins. Anyone who has tried to put a tire on this type of rim when rust under the bead has increased the diameter will, I believe, appreciate the idea. See Fig. 1.

Manila, P. I.

R. N. C.

### A Device for Detecting Loose Bearings

Editor THE AUTOMOBILE:—The following is a description of a device, Fig. 2, which ought to interest all automobile repair men. Its purpose is to detect a loose crank bearing or piston pin bearing of a connecting-rod without removing the oil pan. It is also used for testing leaky piston rings. Take a foot pump and add a cup washer the reverse of the regular one so that one will act in each direction. Make a brass fitting to take the place of the base of the pump, the end of which is threaded to fit the spark plug hole. With the piston on upper center, screw the tool into the spark plug hole and by working the plunger up and down, the piston will be alternately raised and depressed and any slack in bearings detected, also by listening at breather hole, any leak by rings will be heard.

Detroit, Mich.

C. R. S.

### Advantages of Auxiliary Air Control

Editor THE AUTOMOBILE:—Would it be an advantage to have some hand control device attached to the intake manifold above the carburetor to make it possible to add an extra supply of air to the mixture when operating an automobile?

2—Could it be made to act as a scavenger and cylinder cooling agent?

3—Could it be used to increase the engine power?

4—Could it be used as an air brake?

5—Would it be useful to cut down gasoline consumption?

6—Would there be any other advantages that could be gained by applying such a device for controlling the air to a car, if any?

Easton, Pa.

W. F. B.

—Many drivers are using such an attachment to great advantage. These extra air devices are open when running at fairly high rates of speed and cut down the fuel consumption.

2—They probably are not of great assistance in scavaging, but as a cylinder cooling agent when coasting down a hill with the ignition cut out, the clutch in and the device open wide, they might be of some slight assistance.

3—The engine power is probably not increased so much as the economy unless the mixture given by the carburetor is given incorrectly in the first place.

4—Not much more than the carburetor alone. The cylinders will probably be filled just as completely without the extra device.

5—Yes, it would probably be an aid in this direction.

6—The main advantage is in flexibility of control of the mixture.

### Sign Your Letters For the Rostrum

The editor of the Rostrum is in receipt of several inquiries and communications which do not bear the signatures of the senders but instead are signed Reader, Subscriber, by initials or other noms des plume. While only the initials are published in THE AUTOMOBILE, unless it is otherwise expressly desired, it is necessary that the letters bear the signature of the sender as an evidence of good faith.

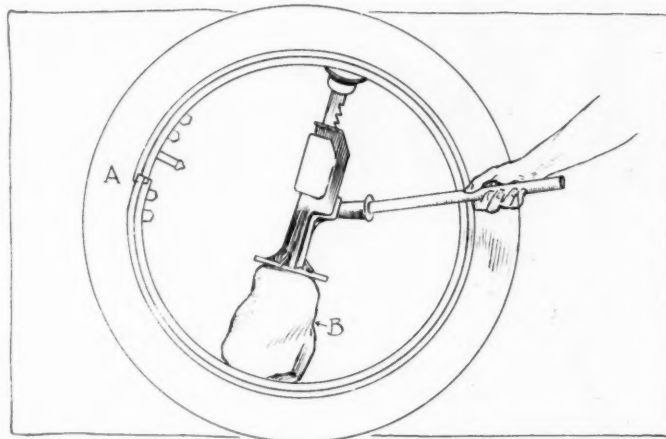


Fig. 1—Method recommended for forcing apart split demountable rims at A, by jack and rock B

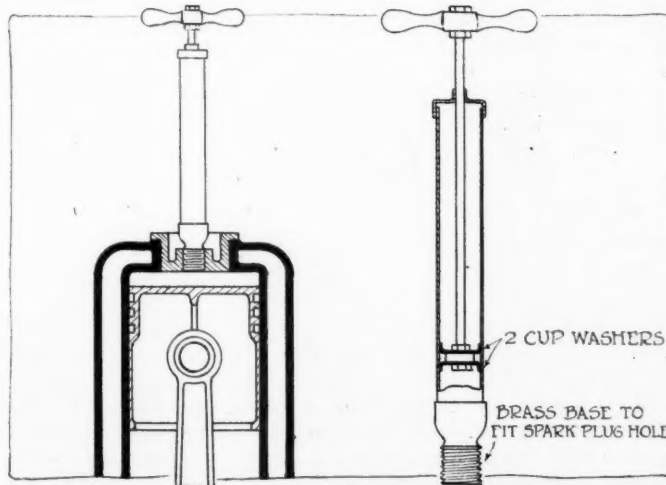
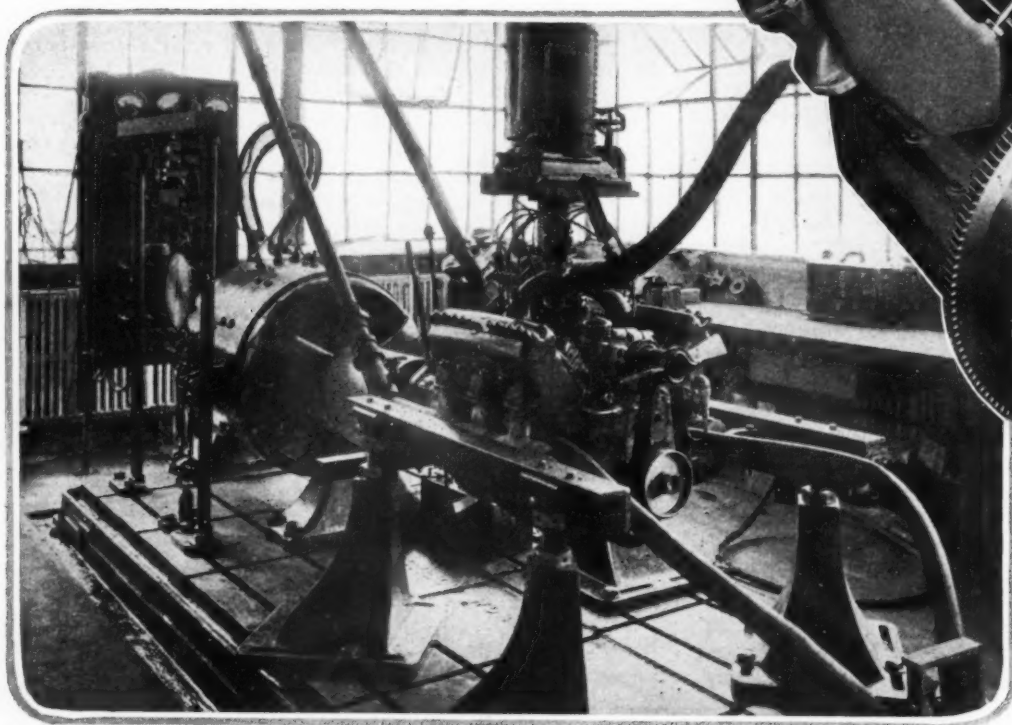


Fig. 2—Device for detecting loose bearings suggested by a Detroit reader

## Ferro Eight Makes 300-Hr. Test



Above—The Ferro eight motor with overhead valves

Left — Motor mounted on dynamometer in the 300-hr. test

**F**INAL reports on the 300-hr. endurance test of the Ferro eight-cylinder motor which extended from June 23 to July 7 this year, have just been made public. This test, which was reported briefly in *THE AUTOMOBILE* for July 15, was held under traveling conditions, making it approximately equivalent to the service done by a car traveling at a speed of 35 m.p.h. with a motor speed of 1500 r.p.m. for 11,000 miles. At the horsepower developed, namely 34.93, the work done equals that of climbing a grade of 8.5 per cent with a car weighing 3300 lb. Engineers will be interested in the final reports of this test due to the fact that the motor involved several features of construction which are unique in eight-cylinder practice. Among other elements of design found in the Ferro may be mentioned the overhead valves, the unit casting comprising the cylinders and upper half of the crankcase which is cored for valve passages, seats, etc., the sixteen camshaft and the firing order which proceeds directly from one side of the V block to the other, that is; the firing order is 1-1, 3-3, 4-4, 2-2.

### Only Eleven Stops

While this test has not been officially conducted under the supervision of any of the automobile clubs, engineering societies or universities, it was a carefully-made factory test and is stated by the Ferro company to be authentic and supported by records on file at the Ferro offices which are open for inspection. The test was continued for 324½ hr. Of this time 12½ hr. were consumed in eleven different stops giving a total actual running time of 312 hr. The stops made were for various causes, all but three of which were due to troubles with accessories and had nothing to do with the

design and construction of the Ferro motor itself. The other three were in each case due to broken valve springs and this, the Ferro concern states, is one of the most valuable points brought out by the test, inasmuch as the springs were purchased in the open market and should not have failed if they had been of proper quality for their strength and size. A repetition of this trouble can now be readily guarded against.

### 59 Hp. at 2250 R.p.m.

The tabulations appended herewith show the results of the test. These are numbered and by referring to numbers 1, 2 and 3 it will be noted that the maximum brake horsepower obtained before the run was 59 at 2250 r.p.m. The horsepower per cubic inch piston displacement and the maximum speeds are both of interest and both high as would be expected in a high efficiency, multi-cylinder motor. It will be noted that the average horsepower developed, the average horsepower per cubic inch of piston displacement and the average revolution per minute were all in excess of what would be expected by the S. A. E. rating. The gasoline and oil consumption, which figures are also given, are quite low.

### Wear Very Slight

After the test the motor was torn down and an examination was made for wear on all the stressed parts. In every case the Ferro organization states that it was inappreciable and in no case enough to produce noise. This performance which more than equals the continuous run of 11,000 miles with a fairly heavy car is noteworthy. Clearance figures are also checked as well as possible. For example, refer-



ring to the name, bearing, the diameter of the shaft and the thickness of the shelves of the babbitt bearing was measured by a ball micrometer. The connecting-rod bearings were in excellent condition, the increase in clearance being 0.0008 on the inner as well as on the outer bearings. The main bearings showed an increase of but half that quantity, 0.0004 in.

#### Bearings Stand Up Well

The construction of these bearings has thus been shown to be reliable and is indicative of the soundness of general practice. The bearings are babbitt against the crankshaft; for the connecting-rod bearings and a hardened steel connecting-rod against phosphor bronze for the upper bearing of the connecting-rod. The smooth polished surface of the rod bearings indicated ample bearing surface and lubrication. The condition of the seats of the valves in the cylinder would seem to bear out the claim made for the overhead valve type of construction. There was no carbon that prevented the proper seating of the valves nor any pitting to cause leakage. The importance of this was demonstrated by the fact that the horsepower at the end of the run was greater than at the beginning.

No carbon deposit could be noted on the piston heads and this was probably due to the fact that the temperature at all times in the endurance run was quite high and prevented the collection of anything more than a small quantity of hard baked carbon. The combustion chambers were slightly carboned and no signs of scoring were noted in the cylinder barrels.

#### Overhead Valves Wear Well

Regarding the overhead valve operating mechanism, but little wear could be noted here. The spherical fulcrum of the valve rocker arm evidently helped to eliminate wear and noise and proved itself easy to lubricate while the unequal lengths of the rocker arm seem to bear out the prediction that the inertia would be reduced and consequently noise and wear. Little or no indication of any wear at the points of contact with the valve stem and pushrod was noted. The other parts of the valve operating mechanism such as the cam faces, valve tappets, guides and pushrods were also subjected to an examination and shown to be in good condition.

#### Some Ignition Troubles

Some ignition troubles were experienced during the run due to spark plugs and a worn distributor head and in the subsequent horsepower tests the condition of the distributor had some effect upon the performance of the motor at low speed. This disappeared at higher speeds.

Table No. 3 in the illustrations herewith showed the condition of the Ferro eight after the tests. The higher horsepower after the run, namely 61 at 2250 r.p.m. in spite of the worn distributor very clearly brings this out. The tabulations follow:

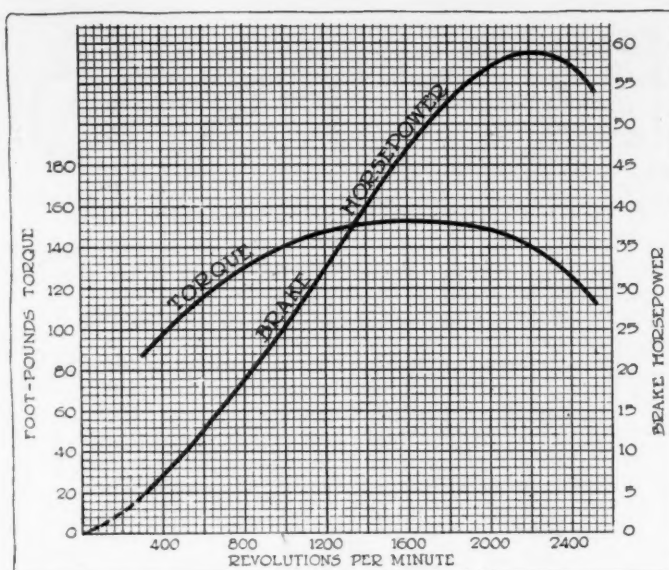
Specifications of Model 2 Ferro Eight in 300-Hr. Test

Number of cylinders.....	8
Bore and Stroke, in inches.....	3.1-4 x 4
S. A. E., Hp. Rating.....	33.8
R.p.m. at S. A. E. Rating.....	1500
Piston Displacement in Cu. In.....	265.6
Weight of Motor in Pounds.....	585
Type of Cylinder.....	V Block
Type of Valve.....	Overhead
Lubrication.....	Pressure Feed
Carburetor.....	1-in. Double Zenith
Cooling.....	Thermo-siphon
Ignition.....	Delco
Spark Plugs.....	Bosch

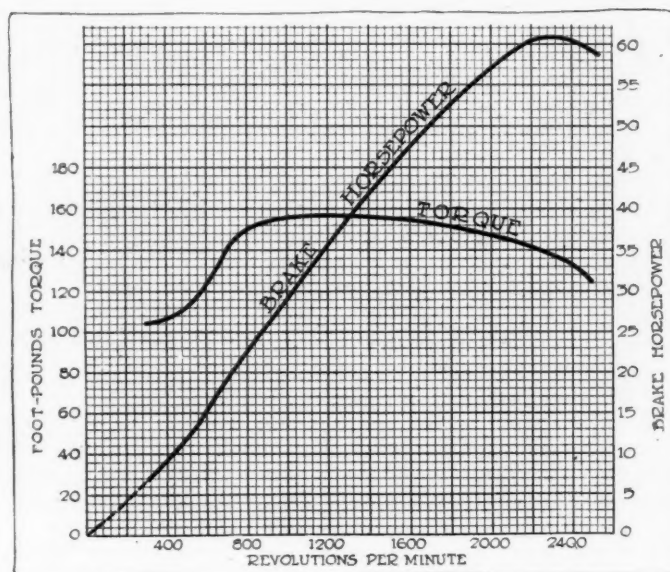
TABLE I

Hp. Tests Made Before 300-Hr. Run

Max. B. Hp. Obtained.....	59.0
Corresponding R.p.m.....	2250
Hp. per Cu. In. Displacement.....	0.222
Max. Torque in Foot-Pounds.....	154
Corresponding R.p.m.....	1500
Max. Speed Attained R.p.m.....	2500
Corresponding B. Hp.....	54.0



Horsepower and torque curves taken before 300-hr. run



Horsepower and torque curves after the 300-hr. run

TABLE II

300-Hr. Endurance Run

Dates of Endurance Runs.....	6-23-15, 7-7-15
Duration of Runs in Hr.....	312
Average Hp. Developed.....	34.93
Referred to S. A. E. Rating in Hp.....	1.13 more
Referred to S. A. E. Rating in Per Cent.....	3.24 more
Average Hp. Developed per Cu. In. Piston Displacement.....	0.132
Average R.p.m.....	1522
Referred to S. A. E. Rating R.p.m.....	22 more
Referred to S. A. E. Rating in Per Cent.....	1.47 more
Total Number of R.p.m.....	28,492,000
Total Gasoline Consumption, Gal.....	1160
Average Gasoline Consumption, Gal. per Hr.....	3.72
Gasoline Consumption per Hp. Hr. in Lb.....	0.6283
Total Oil Consumption, Gal.....	50.50
Oil Consumption per Hr., Gal.....	0.161

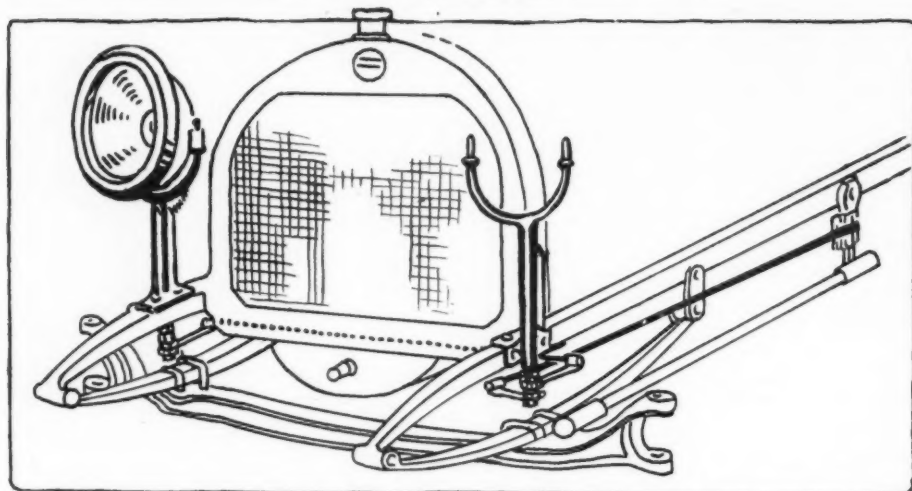
TABLE III

Hp. Test After Run

Average Temperature of Inlet Water Degrees Fahr.....	71.6
Average Temperature of Outlet Water, Degrees Fahr.....	139.3
Range of Temperature.....	57.7
Stops Due to Motor Troubles.....	3
Max. Hp. Obtained.....	60.75
Hp. per Cu. In. Piston Displacement.....	0.228
Increase of Hp. After Run in Hp.....	1.75
Increase of Hp. After Run in Per Cent.....	2.88
Corresponding R.p.m.....	2250
Max. Torque Ft.-Lb.....	155.5
Corresponding R.p.m.....	1400
Increase of Torque After Run in Ft.-Lb.....	1.5
Increase of Torque After Run in Per cent.....	0.97

NOTE—No work done on motor before test. The valves were not ground.

# ACCESSORIES



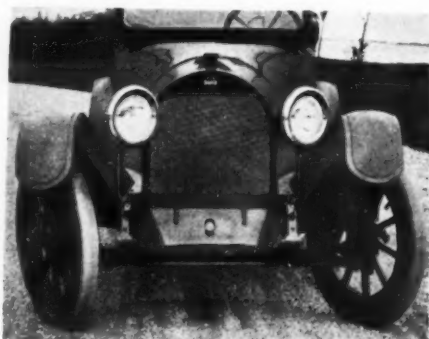
Sketch illustrating the operation of the Steer-Lite headlight bracket which automatically turns the headlights in the direction in which the front wheels are carrying the car

## Steer-Lite Headlight Bracket

THE need for an arrangement whereby the headlights are turned in the direction of motion of the car, has frequently been felt. The Steer-Lite device provides such an arrangement whereby the steering motion is duplicated and the headlights in all circumstances throw the light in the direction in which the front wheels are carrying the car. Due to the fact that the linkage for operating the movable brackets is connected directly to the steering drop arm, the amount that the headlights are turned from the center line is directly proportional to the amount that the wheels are turned. The result is that for a given deflection from a straight course in the direction of travel of the vehicle, there is a corresponding deflection of the headlights which will throw the light directly along the path of the vehicle.

With the powerful electric headlights now in use, the driver of a car is forced to turn his vehicle into an area which is practically cut off from all illuminations by the strong wall light thrown out by the parabolic reflectors. With the Steer-Lite bracket the roadway into which the vehicle is turning is illuminated before the turn is made, allowing the driver plenty of time to determine the safety of the intended course.

The construction of the device is shown in the accompanying illustration. The brackets for the lamps fit into two sleeves and rest on cone nuts, which take the load and hold the brackets rigid. The cone nuts are held in place by lock nuts providing a rigid bearing surface. There is a ball-jointed lever which is



How the Steer-Lite device acts on a car



Section through the Woodworth puncture-proof tire



Allwon goggles with two-color lenses

screwed to the base of each bracket and tie rods connect the two bell-crank levers on the bases of the brackets and also connect the steering arm to the base of one of the brackets so that when the steering arm is operated the motion is imparted to both brackets. Careful workmanship and good materials make this a rigid device which can be used for either gas or electric lamps. A special set for Ford cars sells for \$12 and for other cars for \$15.—Motor Products, Inc., Stamford, Conn.

## Woodworth Tire

A new puncture-proof tire called the Woodworth Puncture-Proof embodies the novel principle of employing a strip of chrome leather in place of the metal or other materials usually used in this type of tire. The leather is firmly incorporated in the structure of the tire, forming the innermost layer beneath the tread. The makers guarantee the tire against puncture for 5,000 miles, and to back up their guarantee offer to pay the cost in repairing tires in case they are punctured.

The tires are manufactured from combed Sea Island cotton, the chrome tanned leather being on the inside of the casing. The leather is light, therefore adding very little to the weight of the tire, and its flexibility is great enough to not materially stiffen the wall of the tire. It is stated that the leather is non-heating.—Leather Tire Goods Co., Niagara Falls, N. Y.

## Allwon Motor Goggles

Motor goggles which have two-color lenses have been brought out for the purpose of—in the language of the manufacturer—absorbing optical shocks on the road. The two-color lens is not made of two pieces joined, but of a solid lens of one piece of glass. One is colored darkly enough for the brightest lights, and the other part is left light enough for ordinary use. The color is introduced into the glass, becoming part of it, although the surface of the lens is not disturbed and every part is clearly transparent. The prices for the two-color motor glasses are, for the medium size, \$12; for the large size, \$13.50 per doz. With side shields the regulation size sells for \$13.50, and a larger size at \$15 per doz.—Strauss & Buegeleisen, New York City.

## Lawco Products for Fords

Pressed steel is used for the Lawco muffler for Fords, a number of perforated cups being nested and the aggregate area of the perforations is so large that back pressure is small. The makers state that tests made at the laboratory of the University of Michigan indicated an ability to carry heavy loads with no indication of capacity limit, and that the exhaust is silenced better than with the



regular type of muffler. Price, \$2 each.

Lawco fenders are crowned and of attractive design and are made of twenty-gage steel and finished with hard baked enamel. They are interchangeable with the regulation fenders on model T roadsters and touring cars, but are not adaptable to the 1915 Ford sedan. The hood is of the same quality of material and is finished in the same way; it tapers back to the dash, where it is attached by means of a special head ledge. The fenders sell for \$14 per set of four.—F. H. Lawson Co., Cincinnati, Ohio.

#### Weiss Disappearing Step

A folding step is attached to the under side of the running board and is operated by a pedal or lever manipulated by the driver. When extended the step provides an easy means of access to the car and prevents pulling on the door. When folded, the device is out of sight, and the makers state it cannot rattle. Price, \$12.—The Weiss Co., Indianapolis, Ind.

#### Eclipse Steering Gear Bolt

The arms on the knuckles of the Ford front hubs are connected together by a rod, the joints being held by cylindrical bolts which in time become loose through wear. The Eclipse bolt replaces the originals and is adjustable. A split sleeve has a cylindrical exterior and a tapered interior and through it passes a correspondingly tapered bolt which can be inserted as far as is necessary to expand the sleeve until the hole is snugly fitted and locked in place by lock-nuts. Wear is taken up by inserting the tapered bolt further. The bolt is drilled and fitted with an oil cup. Only a wrench is required for application. Price, \$1 per pair.—Eclipse Machine Co., Elmira, N. Y.

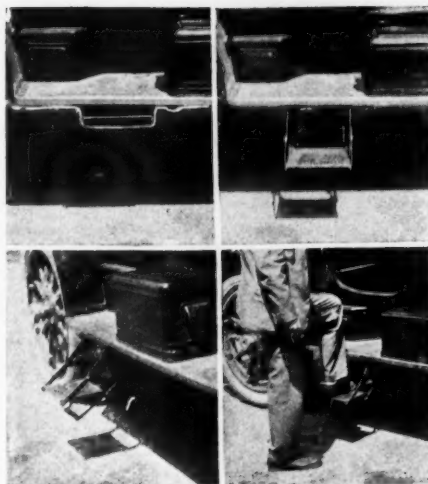
#### Triplexd Gasoline Hose

Triplexd hose is made in all sizes. The inner tube is of flexible metal construction, the second layer is of composition and the outer cover of loom woven jacketing. The makers state that it is more flexible than rubber-covered gasoline hose. Special types are made for steam, oil and air. Price ¾-in. size, 80 cents per foot. Couplings \$1.50 per pair.—Metal Hose & Tubing Co., Brooklyn, N. Y.

#### Cushion Wheel

Sewell cushion wheels for motor trucks and passenger cars are made in two types, the single and the dual. In either type the inside wheel is carried on a series of trusses of rubber which occupy the space between the wheel and the outer felloe. Rubber side flanges encircle the wheel on both sides and connect the inner and outer felloes, making the space containing the rubber cushion proof against air, dust and grease.

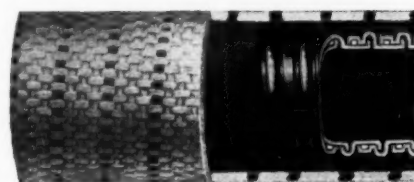
These rubber flanges expand and contract between the inner and outer felloes



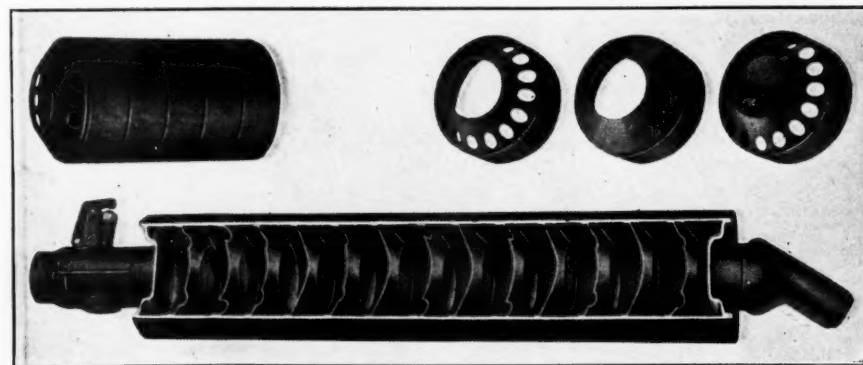
Four views of the Weiss auxiliary step



Eclipse steering gear bolt for Fords



Triplexd gasoline hose, showing construction



Lawco muffler for Ford cars, showing the method of nesting the pressed steel sections

as the cushion acts. There are two steel bands on each side of the wheel and they are bolted through, holding the side rubber flanges and the two wooden felloes in place. These bands expand partially over the rubber cushion from above and below, thus preventing lateral or side motions.

It can be noticed from the construction of these wheels that no connection occurs between wood and wood or wood and iron. The manufacturer claims that by using these cushion wheels the tire mileage is greatly increased and maintenance cost reduced. The axles are protected from shock and it is pointed out that the operating speeds may be increased without injury.—Sewell Cushion Wheel Co., Detroit, Mich.

#### Serco Horn Buttons

The Serco is a steering wheel rim in which are eight buttons for sounding the electric horn, the buttons being spaced around the wheel so that there is always one within easy reach, even if but one hand is being used for steering. Spring contact buttons are used, in composition casings, and the wire is sunk in a slot, 3/16 in. deep, in the rim, the slot being filled with wood over the wire, making a neat finish. The advantage claimed for the device is that the horn can be sounded at any time, even if one hand is engaged in shifting gears or other service; the hand that is on the wheel can always reach a button without difficulty. Price, \$5 and \$6.—Safety Electric Rim Co., Middletown, Ohio.

#### Kamlee Running-Board Trunk

A new type of running-board trunk has been put on the market which is just wide enough to utilize the full width of the board without protruding over the edge and low enough not to interfere with door operation. Two suit cases fit into the trunk, the lid of which is hinged at the edge so that it may be dropped over the edge of the running-board. This style trunk is made for any car. It is 49 in. long, 12 in. wide and 9 in. high and sells for \$45.—The Kamlee Co., Milwaukee, Wis.

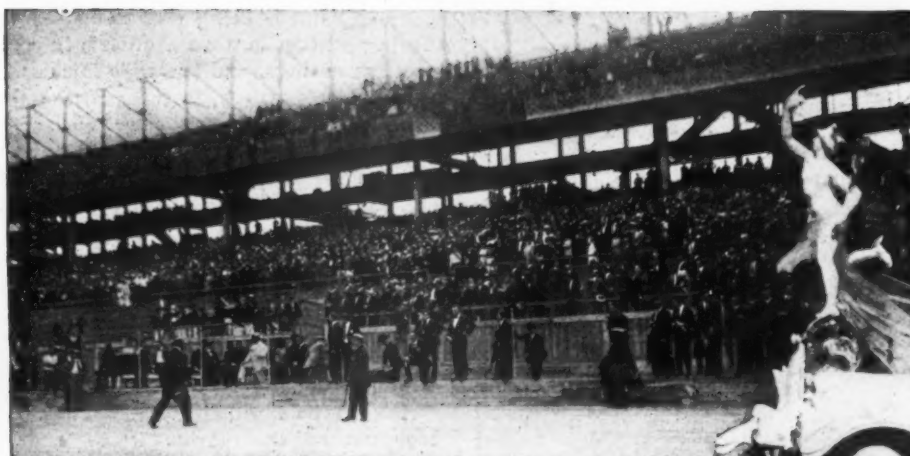
# Christen Sheepshead Bay Speedway

Resta Breaks 10-Mile  
Record



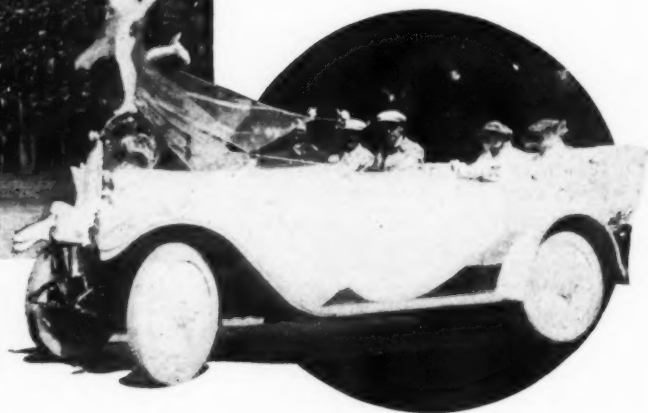
Above—At the right is Mrs. Orson Kilborn, daughter-in-law of Horace M. Kilborn of the speedway, christening the Sheepshead Bay motor speedway.

At the upper left is Resta getting the checkered flag at the finish of his recordbreaking 10-mi. time trial, which he made at 108.04 m.p.h.



Above at the left is a scene at the Sheepshead Bay motor speedway track during the opening ceremonies last Saturday. Over 12,000 people were in attendance

At the right is the Oldsmobile prize winner typifying speed in the parade of 2247 cars in celebration of the opening of the Sheepshead track

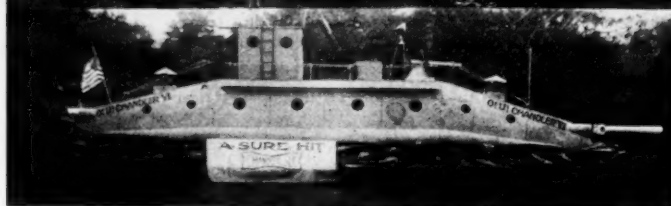
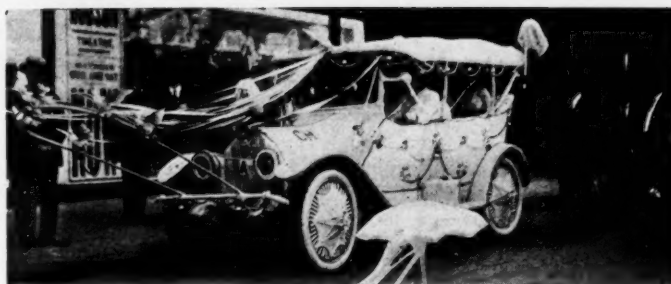
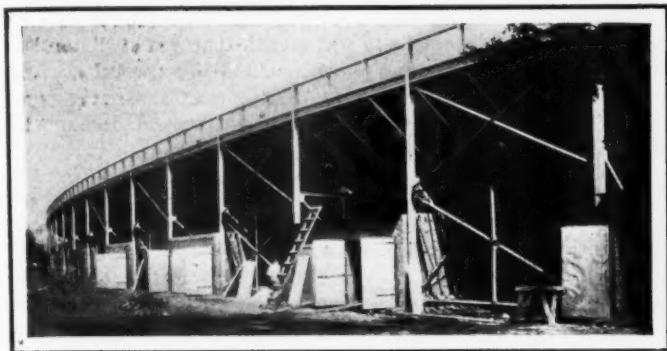


Panorama of the Sheepshead Bay motor speedway showing the completed course, judges' stand and the banking on the turns. Note the large that all previous speed



SOME idea of the merits of the paraboloid banked turns of the Sheepshead Bay Speedway as compared with the flat bank of the Chicago board track was revealed on Saturday when Dario Resta at the wheel of a Peugeot drove 10 miles in 5:32  $\frac{4}{5}$ , a rate of 108.04 m.p.h.

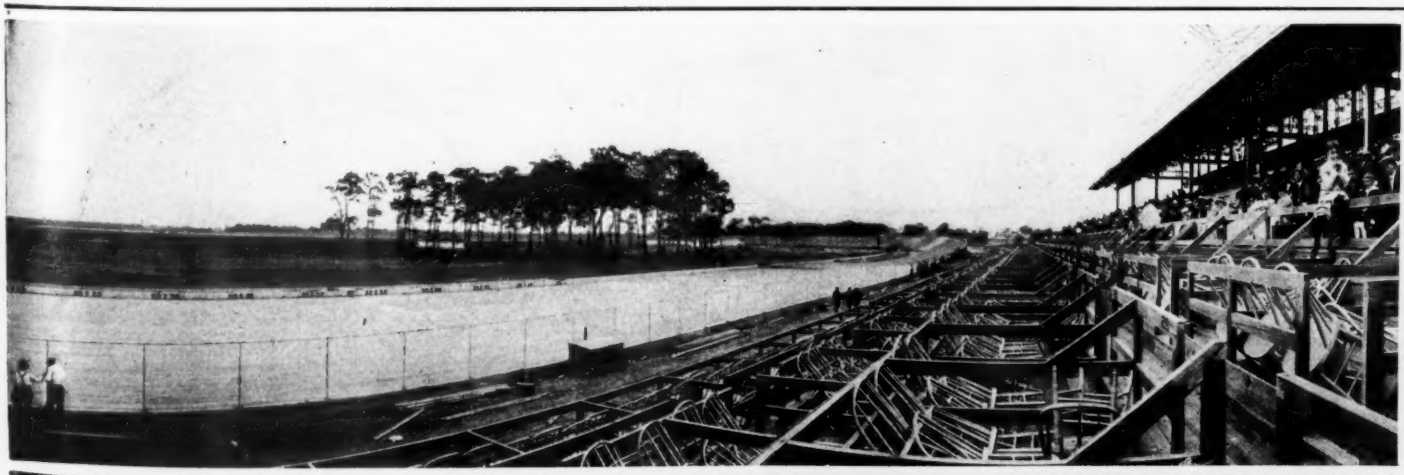
Resta thus has succeeded in driving faster than anyone else for 10 miles, the best previous American record being held by George Robertson, who drove a much larger Simplex 10 miles on the Los Angeles Speedway on April 9, 1910, in 6:35.62. This is a speedway record regardless of class. The speedway record for cars in the same class as Resta's—231-300 cu. in.—is held by De Palma, who drove the 10 miles in a Mercer at Los Angeles, May 5, 1912, in 7:27.33.



Above at the right are shown three of the prize winners in the parade comprising 2247 decorated and undecorated cars. That at the top is a Marathon, the middle is an Oldsmobile and the bottom one a Chandler

Above at the left is shown the rear of the Sheepshead Bay track on one of the turns where the banking gives an opportunity for locating compact garages for the accommodation of the racing cars

At the left is a scene in the parking space at the Sheepshead Bay motor speedway last Saturday showing some of the 2247 cars which participated in the parade to the track and giving an idea of the attendance at the opening ceremonies



Number of boxes in front of the covered grandstands. Over this course will be held the 350-mile race on Saturday, Oct. 2, and it is expected records will be broken



Model W-5 Sheldon worm-gear axle for 5-ton trucks

## 5-Ton Sheldon Axle with Ball Bearing Worm

### Rear Wheel Brakes a Feature

**A** NEW worm-gear axle for trucks of 5-ton capacity has been brought out by the Sheldon Axle & Spring Co., Wilkes-Barre, Pa., under the model number W-50. After putting this new model through tests for several months, it is now ready for delivery. The new W-50 worm axle has been designed and tested for a tire load of 18,000 lb., including the weight of the chassis, body and pay-load and like all other Sheldons is a semi-floating design arranged to secure the greatest possible capacity with low weight and few parts.

A feature of Sheldon axle practice which is carried out in the new design is the use of ball bearings to take both the radial and thrust loads in the worm-gear carrier. The thrust is taken by a self-contained double-acting thrust bearing and the radial load is taken by two single row annulars. The differential is mounted on single row annular bearings while the side thrust, differential and axle shaft are taken by separate thrust bearings. Either double row annular ball bearings or straight roller bearings may be used at the wheels.

#### Brakes on Rear Wheels

Sheldon practice has also been followed in the construction of the brakes. As in all other Sheldon worm gears, this is done at the rear wheel rather than on the propeller shaft as the driving strain is taken through the springs thereby eliminating strut rods and torsion tubes. The track is 74½ in. with maximum spring center distances of 49 in. with 4-in. springs. The housing and brake spiders are hydraulically pressed on nickel-steel tubing and then riveted. The axle shafts are tapered to give a structure of uniform strength at all sections of the shaft. The shaft diameter is 3¼ in. at the outer bearing and the taper runs from the bearing collars to the differential. This provides the best possible distribution of the material while the material itself for the shaft is drop-forged 3½ per cent chrome-nickel steel heat treated to give it the designed physical properties.

For hardness, every driveshaft is given a Brinnell test before going to the machine shop, and any shaft not coming up to the proper standard, is eliminated.

Double internal band brakes of what are known as the self-intensifying type are employed and are 3 in. in width and lined with Raybestos. They act on 24-in. cast steel drums, the bearing surface of which is machined to eliminate any high or wavy spots in the drums and thereby assure a perfect braking contact at all points.

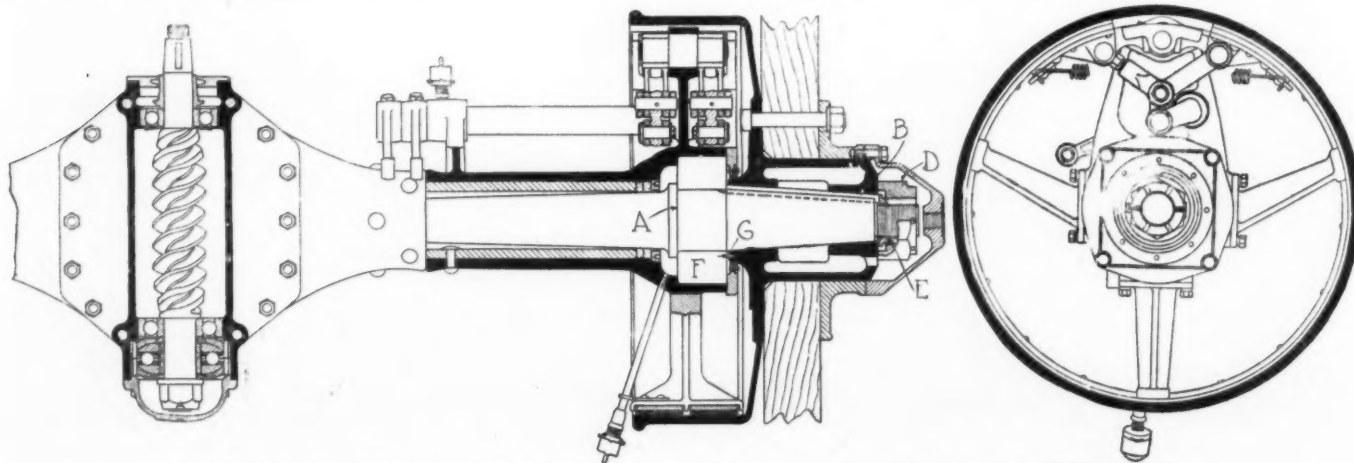
Steel against bronze, both metals being of the Sheldon private formulæ are used for the worm and wheel. This part of the axle receives the most minute inspection as regards accuracy. Every individual worm and wheel being tested in a precision measuring machine to 0.0001-in. for accuracy. These tests are made so complete that absolute interchangeability of all worms and wheels is assured.

The axle housing ends are bell-mouthed to resist distortion due to the hydraulic pressure when mounting the tube. Another safety precaution is in the flanging of the outer ends of the wheels where ribbing is placed to prevent damage in case the clutch is driven against the curb stone.

#### Bearings in Box Sections

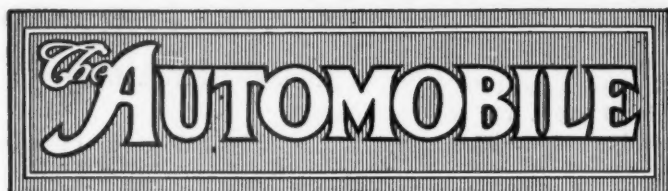
A special feature which is noteworthy is in the construction of the wheel bearing housings which are made in box sections. Referring to the illustration, it will be noted that *D* and *E* are double nuts. The function of *E* is to take the key *B* against the bearing *F* and tighten it against the shoulder on the driveshaft *A*. This prevents the possibility of the bearing moving laterally on the driveshaft and producing a pounding action on rounding corners. The nut *D* is merely to tighten the hub on the conical part of the shaft. Both of these nuts are afterwards locked with cotter pins. The inside nut *E* which tightens the key is slotted and sometimes serves the purpose of a lock nut. This device eliminates any necessity for clearance between the bearing and hub as shown at *G*. This clearance is often allowed to permit the bearing *F* to float on the shaft. Repeated blows are apt to enlarge this clearance.

The W-50 model is also provided with a wheel puller attachment as indicated in the drawings herewith. The operation of demounting a wheel from this 5-ton axle consists simply in removing the hub cap, taking off the wheel retaining nut, replacing the hub cap, and giving a few turns to the wheel removing stud which accompanies the axle. The axle ends are so designed that when the wheel has been removed, the bearings remain undisturbed and protected in their housing upon the axle shaft. Tie rods and ribs are eliminated entirely in Sheldon construction, this concern maintaining that from experience they are satisfied that if the tie rod is tight enough to perform any function it tends to buckle the axle and if it is loose, enough so as not to endanger buckling it lets the axle down.



Structural plan and end views of the Sheldon overhead worm gear axle for 5-ton commercial vehicles





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## Research Committees

ONE of the most valuable works which a section of the Society of Automobile Engineers can perform is to appoint a committee on some pertinent topic and have them pursue this to its end, drawing up a report which covers the state of the art at the present time and thoroughly goes into the patent situation, thereby making up a record which cannot help but be of value to those who intend going further on the same subject.

The report of the Metropolitan Section Research Committee on governors is published in this week's issue. This report is a good example of what can be done in the way of setting down in concrete form the progress of development of a certain line of work. It cannot be doubted but that in the future any one who is carrying on research work in governors will take advantage of this report to familiarize himself with what has been done in the past and also on the status of the patent situation. Were it not for this report, those investigating the subject in the future would have to go through the many hours of labor spent by the committee which, owing to its official connection, has been enabled to secure co-operation not always possible for an individual.

Furthermore, the work of the committee becomes a matter of public record, while that of an individual is only private property and is valueless as regards the general advancement of exact information.

## Aluminum Alloys

ONE of the things to be considered in the use of aluminum alloys is that rigidity is not only gained by the physical properties of the material, but also by its disposition. Hence, the question of ribbing, which is nothing more than placing the material as far from the neutral axis as possible in order to increase the section modulus, becomes of the highest importance.

With aluminum pistons, the ribs not only add to the stiffness of the design, but also act as a means of removing the heat from the piston head. Thus, the piston is preserved against disintegration in two ways by these ribs, first, by stiffening it and then by carrying the heat away so that the high temperature will not cause deterioration of the metal in the head.

With these objects in view, it is essential that designers of aluminum pistons carefully arrange disposition of material so as to provide a means of carrying away the heat of the piston head and also to give stiffness and rigidity to the castings.

## Fall Duties

AUTUMN means either one of two things for the automobilist. It either brings a period of renewed activity or, on the other hand, it may mean the shelving of the faithful vehicle until the next summer season. In either case there are several duties that should be performed by the car owner if he wishes to do himself justice and secure the full return from the money he invested when the vehicle was purchased.

Old oil is often allowed to collect in the crankcase; the fall is the time to take it out. Storage batteries may have been somewhat neglected during the unpleasantly hot days; the fall is the time to bring out the hydrometer and see that the electrolyte is in good condition. The supply of air-tight inner tubes may have dropped so low that the driver is wondering what he should do in case he had a puncture on the road. Now is the time to go over the old tubes and bring them back into such condition that in case the season-old tires should be punctured it would not necessitate a hasty and most likely unsatisfactory repair on the road.

In a word the hundred and one duties that every automobilist knows should be done to put the car back into first class condition should now be performed. Deterioration is the worm that gnaws at the value of a car, and the fall cleaning and repairing will minimize the effects of the deterioration. If the car is to be put away for the fall and winter season it would be far better for the car and for the peace of mind of the owner if the car were put away in such condition that when the next summer comes it will only be necessary to dust it off and bring it out, ready for use.

If the car is to be stored, full direction for the proper method of procedure can be secured from the battery manufacturer, and these should be followed to the letter.

## Packard Prices \$150 to \$200 Higher

### Increased Wholesale Costs of Aluminum, Steel, Leather and Other Materials Responsible

DETROIT, MICH., Sept. 21—*Special Telegram*—The prices on all Packard twin six models have been increased \$150 to \$200. The 1-25 models, which are on the short wheelbase chassis, have all been raised \$150, while the 1-35 types, on the long wheelbase chassis, are all increased uniformly \$200. These increases will bring the prices of the 1-25 with open body to \$2,750 and the 1-35 open models to \$3,150.

The increases apply also to the closed car types, those mounted on the short wheelbase going up \$150 and the others \$200.

The price increases are ascribed to the increased cost of materials and the company states that it can show where every dollar of the rise comes from greater wholesale costs of aluminum, steel and leather, which, among other raw materials, have been largely responsible.

### W. H. Gray Resigns from Gray & Davis

BOSTON, Sept. 21—W. H. Gray, general manager for Gray & Davis, has resigned from that company to take effect Oct. 15. A rumor to the effect that Alexander Churchward also had resigned has been officially denied by officers of the company. The W. H. Gray who has resigned is not William Gray, president and treasurer of the company. Gray & Davis have accepted a contract for war ammunition and while the company does not subscribe to the policy of accepting orders for war munitions to the detriment of its other business interests, changes in manufacturing processes have released much machinery which will be used in executing a large order for high explosive shells. A large heat-treating plant has recently been erected which adds to present facilities and this, with other improved manufacturing facilities and constructional alterations in its product, will permit of a considerably increased production of starting-lighting systems for the 1916 trade.

### Edison Exhibits New Battery

WEST ORANGE, N. J., Sept. 20—Thomas A. Edison exhibited to-day the storage battery at which he has been at work for the last three years. At the same time he announced that arrangements have been completed to market the new battery in light delivery wagons which might be rented by merchants.

The new wagon which was displayed in the laboratory yard at the Edison has a carrying capacity of 750 lb. and a range of travel of 45 miles without recharging. The speed is 10 m.p.h. and is designed to be very simply operated by a single pedal.

Mr. Edison said the object of the car is to replace the horse-drawn delivery wagon of the small merchant. He claims that the cost of upkeep of delivery wagons, including current and storage, will equal only half the cost of feeding and stabling one horse, while the cost of tires would be less than shoeing one horse. Mr. Edison remarked that while the price of feed is increasing the price of electric current is decreasing so that the saving of money by the use of the small battery vehicle would increase proportionately.

### L. P. C. Motor Co. Makes Voluntary Assignment

RACINE, WIS., Sept. 17—A voluntary assignment was made on Sept. 16 by the L. P. C. Motor Co., Racine, Wis., to F. Lee Norton, who represents the company's creditors as assignee. The action was taken as a means of conserving the assets and reorganizing the concern on a sound financial basis, operations continuing as usual in the meantime. In a statement issued by Capt. William Mitchell Lewis, president and chief stockholder, the voluntary assignment was made for the benefit of creditors and to enable the assignee to continue the business and thus avoid disposition of the assets at a great sacrifice. Inability to obtain funds in time to meet obligations maturing this month made such action necessary. Captain Lewis said further:

"There is a prospect of obtaining a large order which will make it necessary to operate the factory at its utmost capacity for the next twenty-four months. If this order is placed, the company will probably be able to obtain sufficient funds to continue the business at a large profit."

The L. P. C. Motor Co. was organized early in 1913 to manufacture the Lewis VI. Captain Lewis retired as president and general manager of the Mitchell-Lewis Motor Co. in the fall of 1912. Associated with him in the L. P. C. are Capt. Rene Petard, chief engineer, now at the front with the French army, and James M. Cram, formerly New York branch manager for the Mitchell. The name of the corporation is derived from the first letters of the names of the three principals.

F. Lee Norton, assignee, retired as vice-president and general manager of the J. I. Case T. M. Co., Racine, two weeks ago, as reported in THE AUTOMOBILE for Sept. 16.

## Uniform Time for New Models

### N. A. C. C. Committee to Meet Sept. 28 to Recommend Time for Announcements

NEW YORK CITY, Sept. 20—The committee of the National Automobile Chamber of Commerce, Inc., on a uniform time for announcing new models, will probably meet in Detroit either on Tuesday, Sept. 28, or Wednesday, Sept. 29. The committee has collected a large amount of data from manufacturers and dealers and it is said that its verdict will be in favor of announcing new models some time after September, in order not to disrupt the selling season as is now frequently the case.

The committee, of which Hugh Chalmers is chairman, consists of C. W. Nash, Buick; Alvan Macauley, Packard; A. L. Riker, Locomobile; John N. Willys, Willys-Overland; C. C. Hanch, Studebaker; and W. C. Leland, Cadillac.

### Schmidt Pullman Pres.

YORK, PA., Sept. 20—J. C. Schmidt, of York, has been elected president of the Pullman Motor Car Co. Mr. Schmidt succeeds Edward Fox, who became the head of the Pullman company less than a year ago. Mr. Fox has been made the assistant secretary and assistant treasurer of the company. The new president is one of York's prominent business men, being the president of the Standard Chain Co., with headquarters in Pittsburgh.

### Harris Mutual Motors V.-P.

JACKSON, MICH., Sept. 18—F. A. Harris of Detroit, who resigned as commercial manager of the Hupp Motor Car Co., has acquired a financial interest in the Mutual Motors Co., Jackson, Mich. At a meeting of the directors of the Mutual Motors Co. to-day, Mr. Harris was elected vice-president.

### Chalfant Detroit Electric Eastern Sales Division Manager

DETROIT, MICH., Sept. 17—The Anderson Electric Car Co. has appointed E. P. Chalfant manager of the company's Eastern sales division, with headquarters in New York.

### Draper, of Champion Plug, Dies

NEW YORK CITY, Sept. 20—C. F. Draper, who has represented the Champion Spark Plug Co., Toledo, Ohio, during the past year, died at his home in Brooklyn last week, following an illness which necessitated an operation performed in Dallas, Tex.



## S. O. Raises Prices in St. Louis

Increase, Which Independents Have Been Waiting for, Amounts to 1 Cent

ST. LOUIS, Mo., Sept. 17—Almost simultaneous with the announcement that independent dealers had complained to President Woodrow Wilson of alleged unfair tactics of the Standard Oil Co. of Indiana in its competition with smaller Missouri dealers comes the announcement from the local branch of the Standard that Red Crown gasoline would sell in Missouri for 9.9 cents a gal.—an increase of 1 cent per gal.

The independents had been waiting for this announcement ever since they raised the price of their No. 3 gasoline from 8.9 cents to 10 cents a gal. It was the Standard's failure to fall in with the independents' increase that evoked the protest to President Wilson.

Then a few hours after the Standard's announcement, the independents again raised the price of their product 1 cent, bringing the cost to the consumer to 11 cents a gal., if bought at the filling stations. On the other hand, the price of the same grade of gasoline when bought from the independents' tank wagons was cut one-tenth of a cent, bringing it down to 9.9 cents—the present Standard Oil price.

A. P. Robinson, manager of the Standard Oil branch here, at the time of the independents' first raise, said his company would ignore the independents. The independents now are waiting to meet their second boost in the price of gasoline and intimate that as soon as this happens the price of the independent product will go up again.

Flushed with what they term their "first victory" over the Standard, the independents are even predicting 20-cent gasoline for St. Louis. At the opening of the independents' office in the so-called war between them and the Standard the smaller men announced they would try to bring the price back to 17 cents, from which figure the Standard by 1-cent cuts had reduced the price to 8.9 cents. Now the independents see no reason why they should not get as much for gasoline as New York and other Eastern dealers.

### St. Louis Independent Files Complaint Against S. O.

ST. LOUIS, Mo., Sept. 17—A protest against the methods of the Standard Oil Co. in Missouri was filed with President Woodrow Wilson this week by F. C. Bretsnyder, president of the Bell Oil Co.

of St. Louis, one of the largest independent dealers.

In a letter addressed to the President Mr. Bretsnyder charges that the Standard Oil Co. "appears to be making an unprecedented effort to crush competition in Missouri by cutting the price of gasoline while it is advancing the price in states where competition is not so strong." This was done, he said, while the price of the crude product was rising steadily.

"In the Eastern states where there is but little competition," he wrote the President, "the Standard has advanced its price to correspond with advances in the crude oil. Even in our neighboring State of Nebraska these advances have been made while the Missouri price was forced down."

He points out that while gasoline is selling in New England, Kentucky and Texas for 13, 14 and 15 cents a gal. and in New York for 20 cents the Standard Oil is selling No. 3—the grade most used by motorists—for 8.9 cents a gal. in Missouri. He says that in the last few years strong competition against the Standard has developed in Missouri and that is why the Standard is making its greatest fight in this State.

### Pittsburgh Gasoline Price Raised

PITTSBURGH, PA., Sept. 20—The Atlantic Refining Co. has advanced the price of all grades of gasoline 1 cent a gallon, making bulk quotations as follows: Motor, 16 cents; 68-70, 18 cents, and 73-78, 20 cents.

### Denver Gasoline Up 1 Cent

DENVER, COL., Sept. 16—Gasoline took another jump of one cent to-day, and is now selling at 15 cents at all the filling stations. Some of the garages are selling at higher prices ranging as high as 18 cents. This increase is regarded as chiefly a part of the general advance throughout the country, and the price is still lower than it had been in this territory the greater part of the last four or five years. This has been the second advance of 1 cent in the last two weeks. The 13-cent price in force a few weeks recently was the lowest on record for this territory during the last fifteen years.

### Minneapolis Gasoline Price Advanced

MINNEAPOLIS, MINN., Sept. 20—Both Standard Oil and independent companies announce an advance in the price of gasoline of 1 cent. The advance to 11½ cents was made Sept. 15. This price has prevailed since June 11, 1915. Even at the present price gasoline is much lower than October, 1913, when the figure was set at 16½ cents. A reduction of 4½ cents followed in December, 1914, which continued until June this year. Lessened crude oil production in the mid-continent fields is the reason for the advance.

## Five Owen Cars on Four-Day Tour

Makers of Electrically-Controlled Machines Give Successful Demonstration

GREAT BARRINGTON, MASS., Sept. 22—*Special Telegram*—Touring by the manufacturers received an invigorating stimulus this week when the Owen Magnetic Car Co., New York, conducted a four-day tour of 750 miles which went North through Albany, Lake George and Plattsburg and returned to New York City by way of Burlington, Manchester, Pittsfield and Poughkeepsie, the tour being entirely an invitation one for the technical and trade press of New York and Brooklyn for the purpose of demonstrating the Owen Magnetic car in which an electric magnetic system of transmission replaces the conventional gearset and clutch system.

### Five Cars on Tour

Five Owen cars made up the tour, which embraced a trip through the heaviest grades of the Adirondacks, Green Mountains and Berkshires, the cars averaging over 200 miles per day with traveling averages well up to 25 m.p.h. in the mountain sections. All five cars behaved admirably in the hands of the newspaper men, several of whom drove them for 100-mile stretches. The Magnetic car has publicly demonstrated that it is not an experimental machine but a well tried out proven design that possesses several merits peculiar to itself. The performance of all five cars on the long mountain grades was a surprising feature to all and the effectiveness of the electric brake which holds the car at 15 m.p.h. on the longest and steepest grades adds a new pleasure to mountain touring.

### Entz on the Run

Justus B. Entz, inventor of the electric transmission system used, was present on the run. One car was driven by its owner who has already driven it 7000 miles. Ray M. Owen, president of the Owen company, was host for the party of sixteen. The tour was not restricted by any schedules but was primarily to demonstrate the electric transmission system. One of the new features in driving the magnetic car is that when coasting, the car automatically overruns the engine and when the engine is speeded up at the foot of the decline it takes up the load automatically. The major control rests with a small controller lever on the steering wheel which gives the seven forward speed positions, in another position serves as electric starter and at still another position operates an effective electric brake.

## Trade Review of the Week

### Lack of Cars for Immediate Delivery Handicaps Dealers—Factories Are Busy

DETROIT, MICH., Sept. 21—The industry here showed little change last week over the previous period. Factories are rushed, and activity is everywhere, just as it has been right along.

In dealer quarters they are still feeling the effects of the Michigan State Fair which closed last week. This exposition brought in a good line of prospects which are now keeping the sales forces busy. There seems to be one drawback to the dealer activities, however. That is the lack of cars. It is becoming harder and harder to hold customers to deliveries which in many cases cannot be made for several months. The good days are rapidly going, and buyers want their cars to enjoy as long as they can before winter sets in. Thus they will sometimes go elsewhere when a dealer cannot get them a car within a reasonable time. This is all the more aggravated since many of the cars are about on a par as to value and many prospects do not care which of several that suit their pocketbook they take. Of course, this gets right back to the factories, which say that the trouble in supplying dealers' demands is not alone in Detroit but almost everywhere.

### To Boom Export Trade

To stir up export trade, several of the big companies have already, or soon will, send representatives to foreign countries. Among these are Dodge, Hudson and Hupp. This does not mean Europe, but South America, Australia, etc.

In factory circles, last week's developments included the securing by the King Motor Car Co. of an additional four-story plant of 70,000 sq. ft. floorspace to take care of business growth. This is close to the main plant. The Hyatt Roller Bearing Co. also made Detroit its distribution point, and will have a new warehouse here. At the present time a carload of bearings is being received here daily from the plant at Newark, N. J.

On Sept. 16, Chalmers had the biggest shipping day in its history, 133 automobiles being shipped. Packard began delivery of its twin sixes also, and is working with utmost speed. It is expected that the Packard working force will soon be increased from its present total of 8800 to 10,000.

The Detroit Board of Commerce, always a very active institution, has taken another step which will help the manufacturers. It has opened a co-operative

branch of its bureau of domestic and foreign commerce, the duty of which will be to work with the manufacturers to secure outside business, both domestic and foreign.

### New York Sales Normal

NEW YORK CITY, Sept. 22—Sales conditions during the last two weeks in the automobile trade were normal. The dealers are making many deliveries, and shipments from the factories are coming in regularly.

Now that the vacation period is over, and thousands of those who bought cars to tour in during the summer, are back in town, inquiries from that class of buyers, have fallen off. The dealers, however, are now busy preparing for the fall demand by getting in special bodies. At present there is a considerable demand for closed bodies for winter use. The high-priced cars, especially, are getting in many inquiries for them.

### Three New Dart Truck Models

WATERLOO, IOWA, Sept. 16—The annual meeting of the stockholders of the Dart Motor Truck Co., this city, was held Sept. 10. A 7 per cent cash dividend was declared on the preferred. An increase of about 30 per cent in business over last year, was reported.

The company also announced three new models. One was a small model of 750 lb. capacity, having a 1¼ by 4-in. motor, unit power plant, Disco electric starting and lighting system, 30 by 3½-in. pneumatic tires mounted on demountable rims, 106-in. wheelbase, selling with express body for \$675. Also a ¾-ton worm-drive, using a Buda motor, 3½ by 5½-in. with unit power plant, 124-in. wheelbase, 36 by 3-in. front and 36 by 3½-in. rear solid tires or 36 by 4-in. front and 36 by 4½-in. rear pneumatic tires on demountable rims, optionally, at the same price, \$1,300 for chassis alone. Also a 2 to 2½-ton worm-drive, 4½ by 5½-in. motor, unit power plant, 150-in. wheelbase, 36 by 4-in. front and 36 by 4-in. dual rear wheels and tires, using steel wheels, price \$2,100.

A board of directors was elected, which in turn elected the following officers for the ensuing year: C. W. Hellen, president and general manager; W. A. Baxter, vice-president and sales manager; E. L. Stover, secretary, and C. C. Wolf, treasurer.

### 17,523 Reo Cars and Trucks

LANSING, MICH., Sept. 18—The combined output of the Reo Motor Car Co. and the Reo Motor Truck Co. during the business year ending Sept. 15, was 17,523 passenger cars and trucks of which 16,023 were of the former class.

## Texas Crops Promote Good Trade

### Farmers Buy Many Cars—Trucks in Demand—Good Roads Influence Sales

AUSTIN, TEX., Sept. 20—Several highly favorable factors are contributing largely to the unprecedented activity of the automobile trade in Texas at this time. Overshadowing all other incentives are the splendid crops and the good prices that have been and are being obtained for the different products. While it is true that the State's cotton yield will probably fall a few hundred thousand bales short of what it was last year it is bringing 3 or 4 cents a pound more than it was 12 months ago, while cotton-seed is selling for \$10 to \$15 per ton more than it was a year ago. The wheat yield of Texas was approximately 10,000,000 bushels more than it was in 1914. This season's corn crop was considerably larger than last year, notwithstanding the poor outlook for a good yield earlier in the growing period. The forage crops are by far the biggest ever known. Much of it is being placed in silos and converted into ensilage. Oats and other small grains were produced in abundance.

### Dealers Behind Orders

The first beneficial effects of the splendid crop prospects began to be felt by automobile dealers several weeks ago. Following the increased demand for cars that came from farmers orders for cars began to pour in from merchants and other members of the business element of the different cities and towns. It is stated that there is hardly a dealer in the State that is not far behind in filling orders that he has received for cars.

It is also undoubtedly true that the summer car tourist season has had a great deal to do with the flourishing fall trade of cars. Many people learned for the first time the manifold enjoyments of automobile touring. Others discovered the big business benefits that were to be derived from the use of a car. There was more traveling over Texas in motor cars during the past summer by home people than ever before. Scores of people made tours of thousands of miles in this manner.

Another thing that serves as encouragement to automobile travel in this State is the wonderful improvement that has been made during the last year or two to the public highways. The good roads systems of the different counties have been greatly extended and extensive plans are on foot for further improvements of this character.

The truck and delivery vehicle trade



is keeping pace with that of pleasure cars, according to the reports of dealers of Austin, San Antonio, Houston, Fort Worth and other cities and towns of the State. More sales of trucks are now being made than at any time in the history of that branch of the trade. The motor delivery vehicles have almost entirely superseded the old horse-drawn type of wagons and carts.

One of the interesting features connected with the automobile trade in Texas is the improved appearance of sales rooms, garages and other adjuncts of the business over what they formerly were. Much attention to making these places attractive, convenient and comfortable for the employees as well as to visitors is now being given.

#### Dann Self-Lubricating Bearing

CHICAGO, ILL., Sept. 20—A statement issued by the Dann Spring Insert Co., of this city, brings to light the fact that a bearing which will run without oil and a bushing which will lubricate without grease will soon be marketed. The name of the substance from which these bearings and bushings are manufactured is said to be Amalgamite and the company claims that with its use, a radical change in manufacture should take place due to the elimination of grease cups and even the oil reservoir in the crankcase.

Some of the claims made for Amalgamite are that it is indestructible, is unaffected by temperature conditions and shocks, and that with it scoring of cylinders is impossible because the piston rings can be made permanent lubricators while at the same time they are unbreakable.

#### Jelley Master Carbureter Manager

DETROIT, MICH., Sept. 20—A. L. Jelley for a long time connected with the automobile industry of Kansas City, recently connected with the Master Carbureter Corp., as general manager. W. E. Burk, who formerly was vice-president and general manager, has returned to California.

The officers now in charge of the Detroit organization are as follows: A. L. Jelley, general manager; A. B. Walton, sales manager; E. T. Daniels, secretary and Jesse Cook, engineer.

#### Leon Jaffess Assigns

NEW YORK CITY, Sept. 21—Leon Jaffess, dealer in second-hand rubber, tires, tubes, etc., at 252 West Fifty-sixth Street, this city, 902 North Avenue, Plainfield, N. J., 400 North Fifth Street, Harrison, N. J., 973 Woodward Avenue, Detroit, Mich., and 5019 Euclid Avenue, Cleveland, Ohio, has assigned for the benefit of creditors to Max Bieber.

He began business in 1909. In July last he bought a plant at Plainfield, N. J., for about \$29,000.

## 18,771 Fords Sold in Canada

### Output for 1916 Expected to Be 30,000—Large Stock Dividend Expected

DETROIT, MICH., Sept. 21—In financial circles here the rumor has been current during the last two months that the Ford Motor Co. of Canada, Ltd., will declare before the end of the year an exceptional large stock dividend in addition to its regular cash dividend which amounts to 40 per cent annually.

Officials of the Canadian concern are not willing to say anything regarding the proposed dividend, but local brokers say that this stock dividend will be from 500 to 600 per cent. The par value of the shares of the company is \$100; the most recent sale of the stock was made at \$1,535 a share.

The business of the Canadian company has been very satisfactory since the beginning of the 1916 fiscal year, that is since Aug. 1, 1915. During that month sales made were 206 per cent ahead of those made in August, 1914. September thus far is also greatly ahead of last year in sales. Production is at the rate of over 100 cars per day.

The foreign business or export end of the general business which has always been a most important part of the Canadian company's affairs, is again increasing rapidly, and indications are, so said an official of the company, that it will keep up growing.

Sales in 1915 totaled 18,771 cars; in 1914 the cars sold totaled 15,657. In 1913 a total of 11,584 cars were disposed of while sales in 1912 numbered 6,388 cars.

The output for 1916 is expected to be 30,000 or more.

#### 21,456 Fords in Canada

FORD, ONT., Sept. 20—More than one-third of the total number of automobiles in all the Dominion of Canada are Ford cars, according to the complete registration figures for the year 1914. The exact figures are 21,456 Fords or 38.08 per cent of the total number of cars of all makes. These figures, however, have been materially increased in the present year, for since then 13,155 more Fords have been sold in Canada, and undoubtedly the proportion to other machines is still as great, if not greater.

#### One of Timken's Additions Completed

DETROIT, MICH., Sept. 20—Of the several new buildings which will eventually double the present size of the Timken-Detroit Axle Co.'s plant, one of the biggest was recently completed and is now in

full operation. This is the four-story structure on Clark Avenue, which is now entirely used as an assembly plant for worm drive commercial car axles.

The first floor is used for incoming stock and as general receiving room; the second and third floors are given over to machining axle parts, while the fourth floor is used for assembling the complete axle. The basement is used for stock.

The total floorspace of the building is about 100,000 sq. ft. and with its equipment of machines and machinery cost about \$500,000.

Work is well under way on the new drop forge plant. All departments are working to their full capacity.

#### S. A. August Imports \$96,822

NEW YORK CITY, Sept. 20—Automobile exports from New York City to South America during August amounted to \$96,822. Argentine led the other countries with \$27,330. Venezuela was a close second with \$25,901. Chile was third with \$24,831 and Brazil fourth with \$11,535. Colombia imported \$1,044 worth of cars and the rest of the countries imported only \$1,709 in cars.

#### Burdick with New Era Co.

JOLIET, ILL., Sept. 20—W. J. Burdick has resigned as Western sales manager of the Sears-Cross Co., and hereafter will be connected with the New Era Engineering Co., this city, as secretary and purchasing agent.

#### C. A. Gilbert, Gibney Sales Mgr.

CONSHOHOCKEN, PA., Sept. 20—C. A. Gilbert has been made general sales manager of the Gibney Tire & Rubber Co., this city. Formerly he was Pacific Coast general sales manager for the United States Rubber Co.

#### McKee with Russel M. Seeds

INDIANAPOLIS, IND., Sept. 20—Homer McKee, formerly advertising manager of the Cole Motor Car Co., this city, and since that time Indianapolis representative of the Mahin Advertising Co., has become vice-president of the Russel M. Seeds Co., of Indianapolis.

#### Bethlehem Plug Foreign Orders

NEW YORK CITY, Sept. 20—During the past 2 weeks, more than 100,000 Bethlehem five-point spark plugs have been shipped to the war departments of three of the European countries now at war.

#### Halifax Man Wins Houck Contest

CHICAGO, Sept. 15—J. Mullane, Halifax, N. S., has been declared winner by the judges of the contest promoted by the Houck company, which contest consisted in describing a picture showing an automobile stopped to change a wheel when carrying dispatches in war.

# Milwaukee Dealers Make Big Success of Fall Fair Show

**Proper Methods Prove That When Well Conducted the Fair Show Means More Real Business Than Indoor Exhibition—30,000 See Cars in Week—Gate Receipts Alone \$3,000—Cost \$4,500**

MILWAUKEE, WIS., Sept. 18—It has fallen to the lot of the Milwaukee Automobile dealers to tell the entire country how to conduct an automobile show at a fall fair. This has been fall fair week in Milwaukee, the State fair being held here all week. During the week the dealers of this city have staged one of the best shows ever held in the State from a business point and tonight the dealers instead of being dissatisfied with the fall fair as they were a year ago are happy, and so pleased with the fall fair as a place for a proper automobile show that if it were put to a vote whether to do without the January automobile show in the Auditorium in the city or the show at the fair grounds there would be a majority vote in favor of the fall fair show.

## Show Well Conducted

And this is merely because the motor show at the fair grounds this week has been properly conducted. For nearly seven years the dealers have been exhibiting cars at the fall fair in a half-hearted manner, not very pleased and only exhibiting because, leaving out the city of Milwaukee, 85 per cent of the cars sold in the State of Wisconsin are sold to farmers. Farmers make up the majority of the attendance at the fall fair; then as the Milwaukee dealers reasoned, this fall fair should be the real place to exhibit 1916 cars, but it must be done properly. This was how it was done.

The fair grounds in Milwaukee are typical ones, located well outside of the limits of the city, so that if you go by trolley you pay 7 cents; if by jitney 25 cents, and by taxi, anything from \$1 up. The Milwaukee dealers under the leadership of George W. Browne, chairman of the show committee, and Overland distributor for the State, made up their minds they would not have a show like previous ones of automobiles, in which they were under a cement roof about 20 ft. from the ground, with a manure spreader at one side of them, a traction engine in front of them and a hit-and-miss gasoline engine at their left, making it impossible to sensibly talk sales and cars to customers.

To get matters right Chairman

Browne and the other members of the dealers, including President Edwards, Kissel and Dodge agent, went before the State Board of Agriculture and told them what had to be done for the motor exhibit at the fair.

## What Was Needed

The cement roof, already referred to, covered a vacant floor 150 by 350 ft. If sides were added to this floor and the roof there would be an ideal inclosed building 150 by 350, offering over 50,000 sq. ft. of floorspace, the best in the state fair grounds, for an automobile show. The State Board of Agriculture agreed to erect the cement and glass walls at a cost of \$6,000 and turn the building over entirely to the Milwaukee car dealers for \$3,000, with the provision that the dealers should have absolute control over all automobile and accessory exhibits in the fair and further that they could charge the nominal fee of 10 cents to get into the motor car show, all other exhibit buildings in the fair grounds to be open to all. This was agreed upon, contracts were signed and dealers started to boost for a real motor car show.

## Real Attraction of Fair

That they succeeded has been more than demonstrated by the interest in the show all week. Every day more than 40 per cent of those who paid to get into the show grounds have paid the extra 10 cents to get into the automobile show. The motor car show has been the real attraction of the fall fair. It has by long odds been the only real exhibit. Charging 10 cents for admission has been a success. It has kept the raff out. Those really interested in motor cars, motor trucks and accessories have entered. The show has been as orderly and high-class as any winter show. There have been over sixty makes of gasoline and electric passenger cars; three or four makes of gasoline trucks and over twenty accessory exhibitors. Only 1916 gasoline passenger car models have been shown, and the decorations erected by the dealers, the music provided by two bands and all show regulations are on a par with those of the January show in this city

customarily held in the big auditorium.

This week's show has been a real business show. Cars have been sold, many prospects have been discovered, and the business done in closed cars has been exceptional. Car sales have been made to scores of small towns throughout the State. Milwaukee distributors who have the control of the entire State have had from 50 to 100 dealers in. There have been dealers' dinners and dealers' talks. Many new dealers have been appointed, and best of all, these dealers have contracted for cars which are for immediate delivery. It has not been a case of the new dealers putting off the placing of actual orders for a month or two, as is the case in the January show. Now is a good time for the dealers throughout the State to make sales and deliveries. The farmers have finished harvesting. Some have sold their crops and got the money in the bank. They know how much they have to spend. There are three good months ahead of them in which they can use the new car. The slack season of the year is ahead of them. It is a good time to buy a car. In the spring they are very busy sowing the crops. The dealer has a much better chance with the farmer and small-town buyer in September and October than in February and March and April. If the dealer waits until spring the farmer will have spent a good part of his money in farm machinery, etc. To-day the dealer has an even chance with all of the farm implement agents and others who are looking for some of the crop money.

## 30,000 See Show in Week

And the Milwaukee dealers have made a little money out of the show. Members of the dealers' association will perhaps get the money returned that they paid for exhibit space. They charged 25 cents a square foot for space, the average dealer paying \$110 for his space, those taking double space paying \$220 and a few paying over \$300 for large spaces in which a dozen cars were shown. Before the show opened the dealers had taken in over \$1,600 for exhibit space. On Wednesday 6500 paid admission to the motor car exhibit, giving a revenue of \$650 for the day, which



was 42 per cent of the paid attendance into the grounds of the fair. Thursday was Milwaukee day and the attendance went much higher. Approximately 30,000 visited the motor show during the week, giving a revenue of \$3,000.

The total cost of staging the show was about \$4,500. This was made up of \$3,000 paid the fair association, and other money spent for advertising throughout the entire State and also to pay for the helpers in the building, such as ticket sellers, door men, sweepers, electrician, carpenter, etc.

#### The Advertising Tour

The advertising scheme of the dealers was a motor tour through the State which was carried out several weeks ago. In this tour over forty-two towns and cities were passed through and the dealers distributed literature on the fair and also on the motor show. They took a brass band on the tour. It played in every city, town and village. It was a grand advertising scheme. In addition the dealers had 300 bill boards advertising the fair and the automobile show. These were in every city, town and village. They cost \$1,050, but proved a good investment.

With such a preparation and such a show is it any wonder that new life was injected into the show and is it any wonder that the dealers are smiling to-night, happy after a week of real good business in spite of the rainy weather that marred the attendance on several days? Organization and co-operation did it all.

#### What the Dealers Say

Hear what a few of the dealers think of the fall fair motor car show.

F. Edwards, Kissel and Dodge dealer and president of Milwaukee Dealers' Association—It is the best business proposition I have ever bumped into at a show. I did more business during the first two days of the show than in the whole week of the winter show. We are selling cars and getting prospects for the city and also for the entire State. Now is the best time of the year to catch the farmer. He is through with the crops and has plenty of money. Farmers and business men from small towns and cities around the State are buying now and want immediate deliveries. The demand for closed cars and those with detachable tops is heavier than ever before. Outside of Milwaukee 50 per cent of our business is to farmers. If it came to vote as to whether we dropped the winter show in January or the fall fair show I would vote with both hands to continue the fall fair show. The attendance this year is good. Next year it will be better. It has been an experiment this year, but show visitors will go home and tell about the motor show and will come back in con-

siderably greater numbers a year hence.

N. E. Osmond, Jeffery—There are sixty-four Jeffery dealers from the State attending the show and many of them have brought prospects with them.

#### Demand for Winter Tops

Edgar Sanger, Hupmobile and Stearns—This show is way ahead of the January one in the Auditorium. We are getting prospects who want cars right now. The farmers all want quick deliveries and that will cause a little trouble with some concerns that cannot make them. The demand for closed cars is growing, in fact, the demand for the detachable top is unprecedented. A car without a winter top is to-day much the same as a person wearing an overcoat but without gloves. Seventy-five per cent of my retail sales are cars with detachable bodies. This is a much better season to place dealers than in January.

#### Farmers Buy in Fall

W. H. Hathaway, district representative, Cadillac—The fall is the best season of the year to sell the Wisconsin farmer. In the spring he is too busy sowing the grain and tilling the soil. This has been a particularly good year with the Wisconsin farmer as all crops excepting corn have been good. This is the best season of the year to sell closed cars, and the January show is entirely too late for closed car sales. October to January are the months for selling closed cars, and this year the closed car business is being worked in small towns around the State. We sell one-third of our cars in the State to farmers. One dealer in a town of 1500 has taken seven cars for 1916.

H. W. Bonnell, Mitchell—At present the country business around the State is ahead of the city business and the fall fair is the best place to round up this country trade. Over forty dealers from the State are at the show with prospects.

Mr. Crafter, Winton—Crops conditions have been good throughout the State and bankers and business men in towns of 1500 and over are in good humor and are buying better than ever before. There is a perceptible demand for cars with special colors, there being many evidences that brighter colors are going to replace the sombre black of the past few years. More limousines are being sold than ever before.

#### Many Truck Prospects

Mr. Millman, Stegeman Truck—We get three or four times more prospects at the fall fair than we do at the January show. We do not expect to sell trucks at this show, but we do get prospects. We are going to exhibit at one or two of the best county fairs in the State. The city markets are over-

crowded and there is better business with the out-of-town people in the smaller places, when you meet at the fall fairs. Our sales throughout the State are three times what they were last year.

George W. Browne, Overland—We have a 600 per cent increase inclosed car business over last year and the fall fair comes at a time when this closed car business can be properly presented to the buyers. Our State dealers are all at the show, many of them with many prospects.

#### Delaware Non-Reciprocal Law May Be Repealed

WILMINGTON, DEL., Sept. 20—An enactment of the last Legislature affecting motorists of other States is proving so obnoxious that the police of Wilmington have voluntarily stopped enforcing it.

Originally the Delaware law was wholly reciprocal, but because some business concerns in Pennsylvania were operating trucks in Delaware without paying a Delaware license, the last Legislature amended the law so as to prohibit motor vehicles owned by non-resident corporations being operated in Delaware without a Delaware license. As little was known of this change outside of the State, non-resident drivers were constantly falling into the trap, and the courts had no alternative but to fine them.

One result of this was to drive business away from Wilmington, though many concerns took out Delaware licenses in order to continue doing business here. For a time the traffic police were making arrests by the wholesale, but there was such a protest that now, instead of arresting a violator they take him to the nearest license agent and if he takes out a Delaware license he is allowed to proceed, but if he refuses he is prosecuted.

It is altogether probable that the next Legislature will repeal the obnoxious law early in the session. This amendment does not apply to cars owned by individuals, who can operate in Delaware with a license of their own State.

#### Proposed New York Law Requires All Drivers Licensed

NEW YORK CITY, Sept. 20—The next Legislature will be asked to enact a law requiring that all automobile drivers be licensed after a qualifying examination. It is stated that more than one-half of the fatal automobile accidents in this city are probably due to the inefficiency of owners or members of the families of owners and in many cases the inefficiency is due to incurable physical defects or to practically unalterable psychological disqualifications.

## G. M. C. 50 Per Cent Dividend

Company Earned \$14,926,322 in Fiscal Year—Seventeen Directors on New Board

NEW YORK CITY, Sept. 18—The directors of the General Motors Co., at their meeting concluded Thursday night, declared a dividend of 50 per cent in cash, being \$50 a share, on the \$16,506,783 in common stock, payable Oct. 15 to shareholders of record on Sept. 30. The board recommended the inauguration of regular quarterly common dividends, the rate to be determined by the incoming board.

The regular semi-annual dividend of 3½ per cent has been declared on the preferred stock, payable Nov. 1 to stockholders of record Sept. 30.

During the 1915 fiscal year which ended July 31, the General Motors Co. earned 81.2 on the common stock outstanding, compared with 37.6 per cent in 1914.

The surplus available for the common stock amounted to \$13,408,839, compared with \$6,201,055 in the previous fiscal period.

The net income, after deducting manufacturing, selling and administration expenses and maintenance and depreciation amounted to \$14,926,322 as compared with \$7,947,412 in 1914. The total cash on hand July 31, of this year was \$14,526,124 and the funded debt amounted to only \$2,328,000, being the balance on the 6 per cent notes which mature Oct. 1. This will be paid off.

### Gross Sales, \$94,424,841

During its business year just ended, the company's gross sales totaled \$94,424,841, the total number of automobiles sold being 76,068. In 1914 the company sold 58,987 and the gross sales amounted to \$85,373,302.

From Aug. 1 to Sept. 14 of the 1916 fiscal year the value of the sales as compared with the same period of 1915 more than doubled, the amount being \$16,176,761 as compared with \$7,585,739 last year.

In view of the expiration of the voting trust on Oct. 1, the following proxy committee was agreed upon for the annual meeting Nov. 16; P. S. DuPont, W. C. Durant, L. G. Kaufman, C. W. Nash and J. J. Storrow, to vote for the following directors: Lammont Belin, director of the Aetna Explosives Co.; L. G. Kaufman, president of the Chatham & Phoenix National Bank; Pierre du Pont, S. F. Prior of the Union Metallic Cartridge and Remington Arms Co.; A. H. Wiggin, C. H. Sabin, J. A. Haskell, A. G. Bishop, E. W. Clark, W. C. Durant, H. J. McClement, C. S.

Mott, C. W. Nash, Thomas Neal, J. J. Roskob, Albert Strauss and J. J. Storrow.

The new board of General Motors will consist of seventeen against fourteen in expiring board. The two boards are compared in the following list, the first eight names in each being identical:

#### NEW BOARD

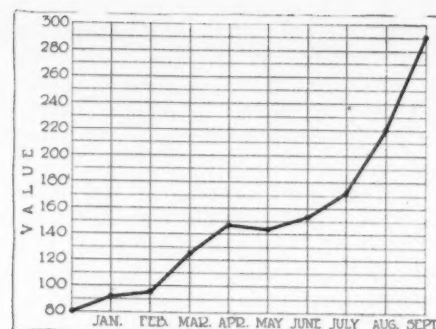
E. W. Clark  
J. H. McClement  
Thomas Neal  
C. S. Mott  
C. W. Nash  
J. J. Storrow  
Albert Strauss  
W. C. Durant  
Lammont Belin  
L. G. Kaufman  
Pierre du Pont  
S. F. Prior  
A. H. Wiggin  
C. H. Sabin  
J. A. Haskell  
A. G. Bishop  
J. J. Roskob

#### OLD BOARD

E. W. Clark  
J. H. McClement  
Thomas Neal  
C. S. Mott  
C. W. Nash  
J. J. Storrow  
Albert Strauss  
W. C. Durant  
Joseph Boyer  
R. F. Herrick  
E. D. Metcalf  
M. J. Murphy  
M. L. Tilney  
Jacob Wertheim

Among the assets carried the past year are \$1,001,000 in municipal securities, a post which was not carried on the balance sheet in former years.

In his statement to the stockholders of the company, President Charles W. Nash, says: "The common stock has never received a cash dividend since the company was organized Sept. 16, 1908. Your directors have followed the policy of building up the cash assets and the credit of the company and so have accumulated and held large cash balances



Showing phenomenal rise in value of General Motors common from first of year to Sept. 18, based on highest value reached each month

pending the maturity of the 6 per cent notes, the original issue of which was \$15,000,000, and the last of which will be paid Oct. 1 next. During the past year, for the first time, it has not been necessary for the company to borrow money.

"Further marked improvements in manufacturing methods will be continued, but can hardly be expected in future to yield such large gains in output with such moderate expenditures on new buildings and machinery as have characterized the last five years. It is also true, in the opinion of your directors, in view of the strong financial posi-

### General Motors Co. Income Account for Four Years

	1915	1914	1913	1912
Net profit sub. cos.	\$14,926,322	\$7,947,412	\$8,284,140	\$4,838,449
Gen'l Motor's share	14,794,190	7,819,968	8,184,053	4,746,757
Int. on notes	336,387	570,235	724,581	850,463
Surplus	\$14,457,803	\$7,249,734	\$7,459,471	\$3,896,293
Pf. dividend	1,048,964	1,048,679	1,048,534	1,040,211
Surplus	\$13,408,839	\$6,201,055	\$6,410,937	\$2,856,082
The profit and loss account follows:				
Profit and loss surplus July 31, 1914..	\$6,689,428	\$2,945,379	\$1,262,594	\$1,240,175
Surplus for year ended July 31, 1915..	13,408,839	6,201,055	6,410,937	2,856,082
Total	\$20,098,267	\$9,146,434	\$7,673,532	\$3,639,259
Plants and equipment	113,107	2,457,007	4,728,153	2,376,665
Profit and loss surplus July 15, 1915..	\$19,985,160	\$6,689,427	\$2,945,379	\$1,262,594

### Consolidated Balance Sheet of General Motors Co. and Subsidiary Companies, July 31, 1915

ASSETS.			
	1915	1914	1913
*Real est., plts., equip.	\$15,819,852	\$15,432,917	\$16,845,949
Pat., agreements, etc.	413,500	471,200	1,508,672
Misc. invest.	367,185	352,735	367,063
Cash	14,526,124	13,452,663	6,236,251
Sec. of other corp., etc.	1,001,000		
Notes and accts. rec.	3,944,681	3,358,791	3,449,335
Inventories	14,049,298	11,642,370	18,170,907
Prep'd exp.	533,586	387,578	412,756
Good-will	7,934,198	7,934,198	7,934,198
Total	\$58,589,424	\$59,114,600	\$58,538,160
LIABILITIES.			
	1915	1914	1913
Pfd. stock	\$14,985,200	\$14,985,200	\$14,985,200
Com. stock	16,506,783	16,501,783	16,501,783
Funded debt	2,328,000	7,852,000	10,935,000
Outstanding cap. stock	528,000	573,000	578,000
Sur. Sub. Cos.	454,423	431,142	409,252
Accts. payable	1,380,908	3,772,123	4,821,744
Liab. acrd., not due	1,270,302	1,000,247	1,048,970
Notes payable			300,000
Res. for pfd. div.	262,241	262,241	262,241
Res. for contingencies	888,406	965,288	2,162,276
Surplus	19,985,160	6,689,428	2,945,379
Total	\$58,589,424	\$59,114,600	\$58,538,160

\*After deducting depreciation reserve of \$6,933,571 against \$6,082,149 in 1914 and \$3,613,029 in 1913.



tion your company now occupies, that the time is near when larger additions to plant, made necessary by the growth of the business should be made. Your board does not believe in running into debt, and it was partly because of these probable extensions, a portion of which have now been authorized, that your board voted to set aside the \$1,000,000 referred elsewhere as invested in short time securities."

How General Motors common stock has ascended since the first of this year is shown in the accompanying table and illustration, which give the bid and asked prices at the beginning and the end of each month.

	Bid	Asked
January 5.....	81	82
January 26.....	90	91½
February 2.....	93	95
February 24.....	94	95
March 3.....	92	93½
March 31.....	124	125
April 6.....	126	128¾
April 26.....	145	147
May 1.....	143	145
May 31.....	135	136½
June 7.....	151	153
June 28.....	152	154
July 5.....	156	157
July 27.....	179½	181
August 3.....	177	179
August 30.....	219	220½
Sept. 7.....	241	243
Sept. 18.....	280	288

In July, 1912, the stock was quoted at 32-33, while in July, 1913, at certain times there were bids at 26 to 32 asked. In September, 1913, the stock quoted 35-37 and at the end of December there was 36½ bid and 38 asked.

At the time of the start of the European war in 1914 the common was quoted at 82-84. Early in December of that year the stock was down to 68-72 but on Dec. 29 the records show that the quotations had again gone up, bid being at 76¾ and asked at 77½.

### New Ajax Tire Plant

TRENTON, N. J., Sept. 20—The annual meeting of the stockholders of the Ajax-Grieb Rubber Co., this city, was held last week, and a dividend of 7 per cent on the preferred and 24 per cent on the common was declared.

A new plant is to be built immediately which will be 200 by 35 ft., three stories, and adding 210,000 sq. ft. of floorspace. Foundations are to be capable of carrying three additional stories which will be added later. The extensions include a new power house, engine, dynamo and boiler units.

### 500 Ross Eights for England

DETROIT, MICH., Sept. 20—The Ross Automobile Co., this city, has closed a contract for 500 cars for delivery this year, with Mann-Overton's Ltd., London, England. Arrangements have also been made for renewal contracts to cover three years and the exclusive representation in the United Kingdom, the Colonies and France.

## Studebaker School for Employees

### Three-Year Commercial, Mechanical and Technical Courses with Savings

SOUTH BEND, IND., Sept. 20—The Studebaker Corp., of this city, has made announcement of the establishment of a training school for the purpose of assisting the young men employees of the corporation to avail themselves of an opportunity of taking a commercial, technical or mechanical course, extending over a period of three years. The conditions as set forth in the announcement are as follows: Regular students must be under seventeen years of age for the preparatory office course and under twenty for the apprentice training course. They must be physically sound and of good moral character. The course will be carried on for three years and will not interfere with the regular work of the student. The student will contribute 50 cents a week of his wages as a guarantee of good faith in continuing in one of the courses until same is finished, which sum will be forfeited to the corporation in case the student should be dismissed for incompetency, irregularity, or any reason other than sickness, or leaves of his own free will. This weekly contribution will be deposited in a savings bank to the credit of the student, the total sum with interest to be returned to the student when he has satisfactorily completed his course. The corporation will in recognition of this effort for self-development pay the student's membership in the Y. M. C. A., and arrange for the course under the supervision of the Y. M. C. A. and pay all expenses. In addition to the foregoing a bonus of \$100, \$50 and \$25 for each student completing the course with an average percentage of 95, 90 and 85, respectively will be given.

### 8-Hr. Day in Studebaker Plants

DETROIT, MICH., Sept. 20—The Studebaker Corp. announces an 8-hr. working day, effective Nov. 1.

### Detroit Makers Benefited by New Local Department

DETROIT, MICH., Sept. 17—Hereafter, Michigan manufacturers and exporters wishing information will not have to write to the Department of Commerce in Washington. The Detroit Board of Commerce has now completed arrangements for the opening of a co-operative branch of the bureau of foreign and domestic commerce and will thus be able to furnish those interested with reports made by the special agents from the

department as well as other information the manufacturers may desire. With the growing domestic and export trade in the Detroit district it has been found advisable to give the manufacturers quicker service and the new branch will greatly facilitate and help in this connection.

### British Makers Meet to Offset American Invasion

LONDON, ENGLAND, Sept. 1—Representatives of a number of leading British automobile manufacturers held a meeting in this city lately, Edward Manville, chairman of the Daimler Motor Co., presiding. The meeting was private, but in an official statement issued after the conclusion of the proceeding, it was stated that "these manufacturers contemplate taking steps to approach the government concerning the complete engagement of the great majority of British motor manufacturers on government work, and their inability, owing to the fact, to meet foreign competition on fair terms, so far as normal trade is concerned."

It was stated that there was still a considerable trade in private and commercial cars, which was being captured mainly by American makers.

### Transmission Ball Bearing Co. Formed

BUFFALO, N. Y., Sept. 16—The Transmission Ball Bearing Co., this city, has been incorporated with a capital of \$100,000 to manufacture ball bearings for motors and trucks. The directors of the new company, which is the United States branch of the Chapman Double Ball Bearing Co. of Toronto, are W. J. Murray and J. P. Beatty of Toronto and W. M. Wilson of Buffalo. The office of the company is at 1407 West Avenue, this city.

### Mitchell Co. After Confiscated Cars

RACINE, WIS., Sept. 20—The Mitchell-Lewis Motor Co., Racine, Wis., has taken steps to recover from the Imperial German Government the value of a cargo of Mitchell cars confiscated by the Germans at the siege of Antwerp more than a year ago. Shortly before the war broke out several carloads of cars were shipped to the Mitchell-Lewis branch at Antwerp. The cars arrived at destination safely, but when Antwerp was taken the Germans commandeered them as spoils of war. The Mitchell company has obtained a certificate from the secretary of state of Wisconsin to prove that it is a duly authorized corporation of Wisconsin, U. S. A., and not a company licensed by a country at war with Germany.

### 100 New Cars a Day

MINNEAPOLIS, MINN., Sept. 16—During the past eighteen days, 1857 new automobiles were registered in Minnesota, or more than 100 a day.

[illegible]



in Milwaukee Sept. 16 and 17. The meeting was called to discuss ways and means for stimulating the lumber trade, which has been in a state of lethargy for many months and shows a need for stimulation. It was decided to make a canvass of all makers of bodies and vehicles who have adopted sheet metal and aluminum for body-making, with a view to resuming the use of wood. The growing use of metal instead of wood has become a serious matter to lumbermen and they intend to use every means within their power to bring about a change in conditions.

#### Manhattan Rubber Raises Wages

PASSAIC, N. J., Sept. 16—The Manhattan Rubber Mfg. Co., this city, maker of automobile tires and other accessories, will give all employees with the concern from six months to two years a 3 per cent increase in wages. Those who had worked from two to five years would receive 5 per cent increases, and all over five years a 7 per cent increase. The company employs about 750 hands.

#### Dividends Declared

Yale & Towne Mfg. Co., New York City: 1½ per cent for quarter out of past earnings, ending Sept. 30, to stockholders of record at close of business Sept. 25, and payable Oct. 1.

Vacuum Oil Co., Rochester, N. Y. 3 per cent, payable Oct. 30 to holders of record Oct. 14.

Electric Storage Battery Co., Philadelphia, Pa.: 1 per cent on common and preferred, payable Oct. 1 to stockholders of record Sept. 21.

## General Motors Features Market

### Other Stocks Rise in Sympathy —General Trade Conditions Have Influencing Effect

NEW YORK CITY, Sept. 20—Automobile securities closed on Saturday with large gains, in sympathy with the General Motors dividend announcement. Conditions in the business world last week also had an influencing effect on industrial stocks. Certain barometers, such as the rise of sterling exchange, which is now quoted around \$4.70, commercial paper rates and the New York bank surplus, and a better aspect of diplomatic affairs, were a stimulus for a very active market.

#### Markets Active

At the opening on Saturday, General Motors made a further extensive advance which it maintained throughout the day, closing at 286, a gain of 31 points for the week. Studebaker common was more active than ever before, and by closing at 128½, the price made a new high record. The Maxwell stocks also showed an increase of activity, and their prices increased moderately.

The automobile stocks' response to the General Motors dividend announcement was instantaneous, with a consequent large selling activity. Goodrich, especially, showed considerable buying strength last week. The directors of this company, it is said will take up the

matter of common dividends at the next regular meeting of the board, which is scheduled within the next six weeks.

The majority of the stocks last week showed substantial gains, ranging from 1 to 31 points. Drops were few and small, ranging from 1 to 7 points.

In the automobile securities, General Motors and Studebaker were the feature and in the tire market, Goodrich, Goodyear and Portage, showed the best gains. Vacuum Oil rose 10 points.

Firestone common went down 5 points while that of the Peerless company dropped 7 points. Willys-Overland preferred dropped 2 points.

#### New Edition of Used-Car Market Report Published

CHICAGO, ILL., Sept. 20—Following the publication of the revised edition of the pocket edition of the Chicago Automobile Trade Association National Used-Car Market Report, covering Zone 7, which centers in Chicago, an edition of the pocket book has been brought out for Zone 9, which centers in Minneapolis. This is in every respect the same as the pocket edition for Zone 7 except that it gives the appraised value for Zone 9. This zone includes Montana, North Dakota, South Dakota, Minnesota, Wisconsin and part of Michigan.

#### U. S. Rubber Reports Semi-Annual

NEW YORK CITY, Sept. 18—Directors of the United States Rubber Co. have decided to issue semi-annual reports, beginning in the middle of 1916.

### Automobile Securities Quotations on the New York and Detroit Exchanges

	1914		1915		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Ajax-Grieb Rubber Co. com.			300	..	..
Ajax-Grieb Rubber Co. pfd.			101	..	..
Aluminum Castings pfd.			102	..	..
J. I. Case pfd.			78	84	+ 3
Chalmers Motor Company com.			109	111	+ 4
Chalmers Motor Company pfd.			96	99	+ 1
Electric Storage Battery Co.			73	74½	+ 3
Firestone Tire & Rubber Co. com.			525	535	+ 5
Firestone Tire & Rubber Co. pfd.			111	..	..
Garford Company pfd.			..	..	..
General Motors Co. com.			286	290	+ 31
General Motors Co. pfd.			114	115	+ 1
B. F. Goodrich Co. com.			65½	67	+ 4½
B. F. Goodrich Co. pfd.			108	110	+ 2
Goodyear Tire & Rubber Co. com.			295	300	+ 11
Goodyear Tire & Rubber Co. pfd.			108½	109½	..
Gray & Davis, Inc., pfd.			..	..	..
International Motor Co. com.			29	31	+ 2
International Motor Co. pfd.			61	65	+ 5
Kelly-Springfield Tire Co. com.			210	213	+ 6
Kelly-Springfield Tire Co. 1st pfd.			88	90	+ 1
Kelly-Springfield Tire Co., 2d pfd.			208	220	+ 8
Paige-Detroit Motor Car Co.			..	450	..
Maxwell Motor Co. com.			45½	47	+ 3½
Maxwell Motor Co. 1st pfd.			89	90	+ 3
Maxwell Motor Co. 2d pfd.			37	38½	+ 1
Miller Rubber Co. com.			190	195	..
Miller Rubber Co. pfd.			107	109	+ ½
New Departure Mfg. Co. com.			..	..	..
New Departure Mfg. Co. pfd.			..	..	..
Packard Motor Car Co. com.			120	130	..
Packard Motor Car Co. pfd.			100	..	..
Peerless Motor Car Co. com.			120	135	+ 7
Peerless Motor Car Co. pfd.			93	94	..
Regal Motor Car Co. pfd.			..	21	..
Portage Rubber Co. com.			55	59	+ 9
Portage Rubber Co. pfd.			93	94	..
*Reo Motor Truck Co.			..	17½	..
*Reo Motor Car Co.			33	34	+ 1
Splitdorf Electric Co. pfd.			..	..	..
Stewart-Warner Speed. Corp. com.			66½	67½	+ 1½

No quotations available on account of the war.

	1914		1915		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Stewart-Warner Speed. Corp. pfd.			105	107	..
Studebaker Corp. com.			128½	130	+ 14½
Studebaker Corporation pfd.			106	107	+ 1
Swinehart Tire & Rubber Co.			86	90	+ 2
Texas Company			153	155	+ 3
U. S. Rubber Co. com.			51½	53	+ 2½
U. S. Rubber Company, pfd.			104	106	+ 3
Vacuum Oil Co.			218	222	+ 10
White Co. pfd.			110	..	..
Willys-Overland Co. com.			192	194	+ 5
Willys-Overland Co. pfd.			105½	108	+ 2

#### OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE ACTIVE STOCKS

Chalmers Motor Co. com.	97	110	115	+ 7
Chalmers Motor Co. pfd.	..	97½	99	+ 2½
Continental Motor Co. com.	155	180	295	+ 5
Continental Motor Co. pfd.	..	75	85	+ 1
General Motors Co. com.	..	..	285	+ 29
General Motors Co. pfd.	..	..	114	+ 2
Maxwell Motor Co. com.	10	11¼	44	+ 2
Maxwell Motor Co. 1st pfd.	29	31	88	+ 1½
Maxwell Motor Co. 2d pfd.	..	..	36	39
Packard Motor Car Co. com.	..	..	120	130
Packard Motor Car Co. pfd.	92	..	100	..
Paige-Detroit Motor Car Co.	..	..	450	..
*Reo Motor Car Company.	..	21¼	33¾	+ ¾
*Reo Motor Truck Co.	10	11	16¾	+ 17¾
Studebaker Corp. com.	..	..	120	125
Studebaker Corp. pfd.	..	..	105	109

#### INACTIVE STOCKS

*Atlas Drop Forge Co.	21	..	..	31
Ford Motor Co. of Canada	..	500	1535	+ 10
Kelsey Wheel Co.	..	..	205	..
*W. K. Prudden Co.	..	20½	20½	22
Regal Motor Car Co. pfd.	25	..	..	21

\*Par value \$10; all others \$100 par value.

## Ford Tractor Plows 5 to 10 Acres Per Day at a Cost of \$3.10—Life 2 Years

Tests and Experiments Still Under Way to Determine Form in Which Vehicle Will Be Put on the Market in About a Year

DETROIT, MICH., Sept. 20—The Ford tractor, which made its initial public appearance at the Michigan State Fair here recently, is now in a fairly advanced state of development, although the officials state that it is not likely that it will be placed upon the market for about a year, as it is intended to prove it absolutely before going ahead with it. Each day during the Fair the tractor was demonstrated to the visitors, and its ability for plowing and hauling shown.

### Many Tests

Tests are being made with the vehicle repeatedly by the Ford company, and the experimenters will not say whether or not the present form of the tractor will be the final form, although it has worked out very well to date. To demonstrate the haulage ability of the vehicle, it was recently driven to Cleveland from Detroit over roads that are fairly good, making the 150-mile trip, pulling a 5-ton trailer, at the rate of 16 m.p.h. It has also made this trip with a 7-ton tow.

### Plows 5 to 10 Acres Daily

As to its ability as a farm vehicle, the tractor is capable of doing from 5 to 10 acres of plowing a day, depending upon the depth of the furrow and the texture of the soil. It can pull either one plow-share 16 in. wide or two shares 12 in. wide. Equipped with the Holley kerosene carbureter, the tractor uses 10 gal. kerosene for 10 hr. work.

### Cost \$3.10 a Day

To figure the cost of operating, then, it should be considered that kerosene, in this locality, costs 6 cents a gal. in barrel lots, or 8 cents in small lots. This means a fuel cost of 60 cents per 10 hr. day. If the cost of the vehicle is to be \$250, then on the basis that the tractor would last one year, which is very low, and also considering that the farm work for a year would not be over 100 days, the cost for amortization would be \$2.50 per day. Adding this to the daily fuel cost, the vehicle figures to cost \$3.10 per day, doing a minimum of 5 acres of plowing.

### Low Fuel Cost

Now it costs at least \$3 per acre to plow with two horses. A team cannot do more than 1½ to 1¾ acres per day,

so that we arrive at the following comparison:

TRACTOR	TWO HORSES
Work per 10 hr. day —5 to 10 acres.	Work per 10 hr. day —1½ to 1¾ acres.
Cost per day—\$3.10, figuring that the life of the tractor is only 100 days, which is very low.	Cost per day—\$3.

The above is on the assumption that the farmer would need a new one each year. Even if he did, he would do the work in one-third the time, or save two-thirds for the same amount of work. It would probably be fairer to consider that the tractor would last at least two years. Supposing it was good for 250 days, the amortization cost per day would be \$1.00. Then the daily cost, including fuel would not run over \$1.60 to \$1.75. Then the comparison with horses becomes more one-sided. Probably a tractor having good care would last much more than two years.

### Uses Standard Ford Engine

The Ford tractor in its present form uses the Standard Ford engine as used in the passenger cars, and this is coupled up to a worm-driven rear axle. Instead of the regular Ford planetary transmission, the transmission is changed to have only one speed, and the band brake is enlarged. But there are two sets of spur gears back of the regular housing for the planetary gearing, which housing is a part of the crankcase and has the regular Ford engine form. These gears give two speeds.

The worm is over the worm wheel, and within a substantial housing which is also the housing of the rear axle unit. By the use of worm drive in connection with the planetary transmission and the two gears back of the latter, an enormous reduction between engine and wheels is obtained. On the highest speed, the reduction between engine and wheels is 32 to 1, while in second speed it is 77 to 1.

### Two Sets of Wheels

Two sets of wheels are used with the tractor. One set is of the regular truck type. The rear pair are used with solid block rubber tires, and the fronts use solid continuous rubber tires, of artillery form. For plowing and field work where greater traction is required, tractor wheels are arranged to fit the same axles in place of the truck-type wheels. The tractor wheels are steel, the rear set having steel blocks around their circumference.

In its present form, the vehicle uses no form of body, having only a single seat for the driver on the left. The engine is inclosed under a hood, however.

At either side of the hood on brackets from the frame are large 10-gal. tanks. The one on the right carries the kerosene, while 10 gal. auxiliary water is held in the right tank. For tractor work, the cooling system must be adequate for the pulling is long and steady with heavy working of the engine—conditions which would heat the engine unduly without the auxiliary water circulation through the 10-gal. tank. It is stated that the cooling is held within reasonable limits by this added water supply method.

On the models shown the public, a stiff frame was used—not the regular Ford car frame.

### Not in Final Form

Probably before the vehicle is finally ready for the market, other changes will be made, although the present construction may prove entirely satisfactory as it is. The Ford concern is experimenting with the vehicle right along and making it prove its ability under all kinds of severe conditions. The aim is to have a vehicle that will serve the farmer well, and until it has advanced to such a state of development that they are sure it will do its work, it will not be put on the market. From information that can be gained, it seems likely that the rural population will have to wait at least another twelve months before the Ford tractor will be a commercial reality.

### Jitney War on in Terre Haute

INDIANAPOLIS, IND., Sept. 15—War on the jitney bus at Terre Haute, Ind., was begun late last evening when suit was filed in the district court by the Fidelity Trust Co. of New York, bondholders for the T. H. I and E railway, who, in turn, are owners and operators of the street railway lines in Terre Haute.

Sixty defendants are named in the notice of the suit, the trust company stating the jitney bus in Terre Haute is being operated by individuals instead of organized companies. The suit is in the shape of a bill of equity, asking for a restraining order against the operators of such lines.

It is cited in the appeal for injunction, that the jitney bus drivers have organized what is known as the Jitney Bus Drivers' Union, No. 168, which is a trades union, recognized by the Central Labor Union of that city. Stress is laid on the contention that Central Labor Union started a boycott against the street car lines in January, 1915, and that since that time the decreases in the income of the street car line in the way of fares have been as follows:



February, \$4,152.53; March, \$4,916.99; April, \$9,255.91; May, \$11,777.62; June, \$10,341.86; July, \$16,834.54; August, \$10,508.83.

It is cited that the railway company has already lost more than \$75,000 on account of the boycott, whereas previous to January, 1915, the average monthly receipts were \$37,000.

#### N. E. Chalmers Dealers Meet in Boston

BOSTON, MASS., Sept. 18—More than 100 dealers who handle the Chalmers line in New England were guests of Harry Pyke, manager of the Boston Chalmers company on Sept. 17 on an outing at the Breaden Cheese Inn, Cohasset. During the meal addresses were made by factory representatives. Vice-President C. A. Pfeffer told of the sales being made during the present time, and how the production had jumped up to more than 120 shipments of cars a day. W. J. Drummleppmann, eastern district representative, spoke about infringements and how the factory would protect dealers. J. M. Cuhelan spoke about advertising and publicity.

#### Portland Jitneys Hurt by Decision

PORTLAND, ORE., Sept. 15—For the second time a Portland jitney ordinance has been given a body blow by the courts. Circuit Judge Bagley enjoined yesterday the enforcement of the second measure. He held the council exceeded its authority in affixing an emergency clause preventing the invocation of a referendum. He also declared illegal a provision requiring applicants for operators' licenses to get certificates from the commissioner of utilities.

The first ordinance was declared a violation of the initiative election law because it was prepared by the council itself before submission to the voters.

#### \$6,178,213 in Washington Cars

OLYMPIA, WASH., Sept. 15—Automobile salesmen are doing a big selling business, according to the personal property returns of the county assessors.

There were 15,223 automobiles in the State of Washington in 1914. There are 21,713 listed this year. The total value of the machines in 1914 reached \$4,924,263, according to the assessors, and \$6,178,213 in 1915.

#### Newark Jitney Ordinance Vetoes

NEWARK, N. J., Sept. 16—Mayor T. L. Raymond to-day sent to the Board of Works his disapproval of the ordinance drawn by that body regulating jitney buses. The mayor said it contained features which may be unjust to the jitney owners.

## P. O. Authorizes 500 Rural Routes

### 288 in Operation—Finds Cost Per Mile Is 34 Cents on a 29-Mile Route

WASHINGTON, D. C., Sept. 18—The Post Office Department has announced that more than 500 automobile rural routes have been authorized and of these 288 are in operation. Their preliminary experience has convinced postal authorities that the new service will greatly improve the farmer's mail and express facilities. Time schedules are better maintained and routes more regularly served in all weather conditions by automobile than by horse-drawn vehicle. Forecasts, department officials say, that the automobiles could not do 50 to 60 miles a day upon regular schedule are not borne out.

#### A Kansas Carrier's Cost

A Kansas carrier gives his experience as to cost, as follows:

Set of tires (Average life 6000 miles) .....	\$60
Gasoline—(1 gal. to 15 miles at 15 cents a gallon, though he is now paying 11 cents) .....	60
Oil—(1 gal. to every 150 miles at 45 cents a gal.) .....	18
Depreciation—(Based on 72,000 miles as the life of his car) ....	40
Repairs per 6000 miles .....	30

Cost of operation per 6000 miles..\$208

\$0 3466 per Mile

From the above, the cost of operation per mile comes to \$0.3466. Applying this figure to his 29½-mile route, this carrier found this to be his outgo for running expenses:

To serve route 250 days by automobile at \$1.02 per day.....	\$255
To hire horse and conveyance at \$1.50 a day for 57 days, or during the period in which he could not use the machine .....	85.50

Cost to serve route .....

#### For a 55-Mile Route

Deducting \$340.50 from his \$1,200 salary, the carrier's net income now is \$859.50. Applied to a 55-mile route, it works out thus:

To serve route 250 days.....	\$477.50
To hire substitute at \$3.33 a day to cover that part of route which the regular carrier could not do by horse-drawn conveyance during the period in which he could not use his machine, and to hire horse and conveyance at \$1.50 a day to do the	

remaining half of the route for period of 57 days .....

Total cost of serving the long route .....

Hence, this carrier, if he received \$1,800 a year for covering 55 miles six days a week, figures that his net income would be \$1,042—or \$200 more than he is now getting.

#### \$64,000 for Postal Cars in St Louis

ST. LOUIS, Mo., Sept. 18—Government-owned motor vehicles of a special design soon are to be installed in St. Louis to supplant the present system of wagon and street car delivery and collection of all mail, including parcel post. Similar service has been ordered installed in Chicago, it was learned here. In both these cities the mail is now being handled by conveyances operating under private contracts. It is said the excessive compensation demanded by these contractors has compelled the government to operate its own machines. The government has been experimenting with motor vehicles in Washington and Detroit and the order for their installation in St. Louis and Chicago is taken as acknowledgement of the success of the innovation.

It is planned to spend \$64,000 for motor cars to handle the St. Louis mails. Their operation, it is estimated, will cost \$112,000 a year. At that the government counts on saving \$3,000 the first year as at present the government is paying \$179,600 for the transportation of mail under the contract system in St. Louis. The motor service will be instituted here Jan. 1, 1916—it is announced in advices from Washington, D. C.

#### Hudson Files Complaint Against Michigan Central Railroad

WASHINGTON, D. C., Sept. 18—The Hudson Motor Car Co., Detroit, has filed a complaint with the Interstate Commerce Commission against the Michigan Central railroad, for a refund of \$527.50 being the freight charges on two automobiles which were shipped over that road to be delivered in Monterey, Mexico, but which were returned to Detroit.

The shipment was made, so the complainant claims, at a time there was an embargo on shipments by way of Laredo. The Hudson company claims that the shipment could and should have been made by way of Brownsville, Tex., but the road refused to divert the shipment promptly and an embargo was placed when it arrived in that city, from where the two cars were ordered returned to Detroit. It is the opinion of the Hudson company that the railroad company is at fault and should be compelled to refund the freight charges.

## Two Racing Co.s Formed

### Indianapolis Speedway Will Race 2 Peugeots—May Enter Other Fields

INDIANAPOLIS, IND., Sept. 15—The Indianapolis Motor Speedway and the Prest-O-Lite Co., this city, are to be represented with racing teams in all the important automobile races of the country. To this end the Indianapolis Speedway Racing Team Co. and the Prest-O-Lite Racing Team Co. filed articles of incorporation yesterday with the Secretary of State. Each company is incorporated at \$20,000.

F. H. Wheeler, Carl G. Fisher, T. E. Myers, A. C. Newby and J. A. Allison are the incorporators of the Speedway Racing Team Co. and Carl G. Fisher, J. A. Allison and F. E. Sweet comprise the Prest-O-Lite Racing Team Co.

It was announced last evening that the Speedway Co. has purchased two Peugeot cars, which arrived in Indianapolis Saturday and that the Prest-O-Lite Co. will use Maxwell cars.

Howard Wilcox and John Aitken, two popular Indianapolis drivers, will comprise the racing team representing the Speedway. Their Peugeot cars probably will be shipped to New York for their first race Oct. 2. It was said last night that the drivers for the two Maxwell cars to represent the Prest-O-Lite have not been selected, but arrangements have been made for Eddie Rickenbacher to captain the team. The two companies, under their charter, may also enter airships and balloons in speed events, though their activities for the present will be confined to automobile racing.

### Syracuse Dealers Want Larger Show in 1917

SYRACUSE, N. Y., Sept. 18—The dealers of this city want a real automobile show in connection with the New York State fair which is held here every year. As yet they have not had one though they hope to have one in 1917 provided plans at present in embryo mature. The show this year is a small one and the results which have come from it to date are not all that the dealers could desire. About a dozen dealers exhibited in tents in various parts of the great fair grounds and two dealers, Buick and Overland, had spaces in one of the big buildings.

The feature of the show was an exhibit of used cars staged by secretary Harry Gardiner of the Syracuse Automobile Dealers' Assn. For his exhibit, Gardiner rented a tent 40 by 70, divided

it into seventeen spaces and then divided the cost of the whole venture, including rent of the tent, cost of the space at 1 cent a square foot, which was the regular rate for space in the fair grounds, cost of advertising, etc., by the number of spaces. This brought the cost per space in the tent to \$17. Members of the association were offered these spaces at this figure for the exhibition of used cars and every space was taken.

With regard to the value of an exhibit at any State fair, most of the dealers were agreed that it was good from an advertising point of view but that not a great deal of business results. The impression prevails that the value of such an exhibit to a dealer is almost directly proportional to the size of his territory; that a dealer with a large territory will benefit to a greater extent than a dealer with a small territory for the reason that the show draws from the whole State and therefore brings in many prospects which do not rightfully belong to the dealer with a small territory.

The following dealers exhibited: Reo Sales Co., Reo; Palmer-Moore Co., Palmer-Moore trucks; Brockway Motor Truck Co., Brockway trucks; Sanford Motor Truck Co., Sanford truck; Erie Trailer Mfg. Co., Erie trailer; Bartlett & Smith Motor Co., Studebaker; H. A. Gardner Stowell Motor Car Co., Packard, Hudson, Dodge; Chalmers-Syracuse Co., Chalmers; Overland-Syracuse Co., Overland; Buick-Syracuse Sales Co., Buick.

### Speedway Presidents to Meet Oct. 1

NEW YORK CITY, Sept. 20—Nine presidents of automobile speedways and dirt track courses throughout the country have been asked to attend a meeting in New York City, Oct. 1, to formulate a working agreement for the 1916 season.

At the meeting, called by Chairman Kennerdell of the contest board of the American Automobile Association, a schedule will be drafted so there will be no conflicting dates. The tracks that will be represented are: Chicago, Indianapolis, Sheepshead Bay Speedway, Minneapolis, Omaha, Sioux City, Des Moines, Providence and Tacoma.

### Overland Wins Philadelphia Sociability

PHILADELPHIA, PA., Sept. 18—One hundred and fifteen cars participated in the fifth annual run of the Lu Lu Temple Automobile Club to Atlantic City, N. J. The time of each car for the trip was taken at the finish and the total of all the times was divided by the number of cars checking in, to arrive at an official time. The result was 3 hr. 48 min. 58 sec. for the approximately 70 miles, and F. G. Roth, in an Overland, who finished in 3 hr. 48 min. 40 sec., captured first prize being but 18 sec. off.

## Fords May Race at Indianapolis

### \$1,000 Prize Race Planned—Only Stock Models Eligible—50 Cars Required

INDIANAPOLIS, IND., Sept. 15—An exclusive Ford contest, for a cash purse of \$1,000, is contemplated by the Indianapolis motor speedway management, as a preliminary event to the \$10,000 invitational 100-mile match race at the speedway, Saturday, Oct. 9. Whether the contest will be held or not depends entirely upon the reception at the hands of Ford owners. If less than fifty cars are entered the race will not be run.

The terms of the contest, as outlined at present, are none but stock Ford roadsters or touring models fully equipped shall be eligible. All cars must be at least six months old. The race will run in five heats of 5 miles each and a final over the same distance. Ten cars will be entered in each heat, the winner of first and second of each heat being eligible for the final.

Winners of the first place in the heats will get \$50 each, or \$250 in all, the remainder of the purse, or \$750, being reserved for the finals as follows: First \$300; second \$200; third \$100; fourth \$75; fifth \$50; sixth \$25.

The speedway management is launching the Ford contest to stimulate interest in small car performances. The Ford was selected to start over other makes of cars, because of its greater distribution. Should the race prove a success it is planned to hold meets for other cars as well.

### Drawbacks Granted by Treasury Department

WASHINGTON, D. C., Sept. 18—The regulations of the Treasury Department of March 4, 1915, providing for the payment of drawback on motor cars and parts of same, manufactured by the Buick Motor Co., Weston-Mott Co., Cadillac Motor Car Co., Northway Motor Mfg. Co., Oakland Motor Car Co., Cartercar Co., General Motors Truck Co. and the Olds Motor Works, have been amended to provide for the filing of supplemental sworn statements and schedules covering other styles and kinds of motor vehicles or parts of same, or showing changes in the quantities and kinds of imported materials manufactured with the use of imported materials, used. Upon verification of such supplemental statements and schedules, drawback may be allowed on articles covered thereby.

The Treasury Department has granted the Ericsson Mfg. Co., Buffalo, N. Y., a drawback of duties on magnetos manu-



factured by that company with the use of imported ball bearings or with the use of ball bearings manufactured by the Norma Co. of America, with the use of imported steel inner and outer rings, cages and balls.

The department has also granted the Driggs-Seabury Ordnance Corp., Sharon, Pa., a drawback of trucks and parts exported.

#### Automobile Shipments to Denver Slow

DENVER, COL., Sept. 17—Automobile car sales in the Rocky Mountain territory are ahead of last year at this time, but many dealers declare that the general condition of the trade is quiet and considerably below what it ought to be. The blame is placed principally upon failure of the majority of manufacturers to supply cars fast enough to keep the trade in a healthy condition. General business conditions are only fair, but crops are good and the favorable reports on agriculture, stock-raising and mining, Colorado's leading industries, are favorable enough to justify the dealers in expecting better business, even at this season of the year. Dealers able to get cars feel that their orders are coming in too slowly, and believe that prospective buyers are holding back to see what develops in the trade in general.

#### Eleven Cars Shown at Louisville

LOUISVILLE, KY., Sept. 17—One of the most interesting exhibits at the Kentucky State fair held here this week was the display of automobiles. This is the first time the farmers in this section of the country have had an opportunity to compare the new models collectively.

The automobile exhibits included the White, Velie, Saxon, Ford, Studebaker, Dodge, Hudson, Overland and the Indiana, Commerce and I. H. C. trucks.

#### Galesburg Holds Show on Street

GALESBURG, ILL., Sept. 20—This city decided to experiment with the fall show proposition, the automobile dealers giving a public exhibition on Main Street from Seminary to the public square in connection with the annual style show, arranged by the dry goods merchants last Tuesday, Sept. 21. Traffic was prohibited on the street set aside for the exhibition.

#### Victor Top in New Plant

ST. LOUIS, MO., Sept. 18—The Victor Buggy & Auto Top Co. formerly at 1545 North Broadway, St. Louis, Mo., is now installed in its new plant at 2215 Pestalozzi Street and has double the capacity of its old plant.

## 29 Sheephead Entries

### Nine Foreign Cars and Four Countries Represented—Trials Begin Sept. 25

NEW YORK CITY, Sept. 21—Twenty-nine entries have been made to date for the 350-mile race at the Sheephead Bay Speedway on Oct. 2. Of these, nine are foreign. According to the conditions the candidates must take part in eliminating trials on the speedway next Saturday and the following two days. To be eligible to start they must show in a one lap trial of 2 miles, an average speed of at least 85 m.p.h. The entries received are:

De Palma	Mercedes
Oldfield	Delage
H. S. Harkness	Delage
Earl Cooper	Stutz
Anderson	Stutz
Driver not named	Stutz
Driver not named	Stutz
Resta	Peugeot
Burman	Peugeot
Mulford	Peugeot
Aitken	Peugeot
Wilcox	Peugeot
Moore	Sunbeam
Pullen	Mercer
Ruckstell	Mercer
Rickenbacher	Maxwell
Driver not named	Maxwell
Porporato	F.R.P.
Driver not named	F.R.P.
Chevrolet	Car not named
O'Donnell	Duesenberg
Henderson	Duesenberg
Driver not named	Duesenberg
Vall	Mulford Special
Alley	Ogren
Ora Haibe	Sebring
Bergdoll	Erwin Special
Driver not named	Erwin Special
Le Cain	Pugh Special

### Buick Six Goes 27.5 M. P. G. with Stromberg Carbureter

CHICAGO, Sept. 16—An economy of 27.5 miles per gallon with the same carbureter setting that gave 56.2 m.p.h. is the showing made by a Buick small six fitted with Stromberg carbureter. The test was made by the Stromberg Motor Devices Co. on a car owned by a private user and was under sanction by the American Automobile Association and supervised by Chairman F. E. Edwards of the Chicago Automobile Club technical committee.

The car was a Buick five-passenger model D 45 which has a six-cylinder 3¼ by 5-in. motor with overhead valves, Delco ignition, lighting and starting. A Stromberg model H-1 1-in. carbureter was fitted with an exhaust air heater. The dash adjustment was disconnected so it could not be changed without lifting the hood. Silvertown tires 32 by 4 in. were used. The top and windshield were down and four passengers were carried. The economy run was over the Chicago boulevard system with the route arranged so the car went about an equal distance in all four directions. A strong wind and frequent showers probably cut down the mileage slightly. One gallon

of gasoline was poured into a special tank attached to the windshield and which fed directly into the carbureter. The amount was determined by a gallon measure stamped by the city sealer. After running 27.5 miles on the measured gallon the car was taken to the speedway where tests for speed and acceleration were made. An officially timed test for one lap of the 2-mile speedway with the same load in the car and the same carbureter adjustment as during the economy run gave 2 min. 8 2/5 sec. for a lap, an average of 56.2 m.p.h. In the acceleration test under similar conditions the car accelerated from a standstill to 30 m.p.h. through all the gears in 11 1/5 sec. On high it accelerated from 5 miles to 25 m.p.h. in 12 2/5 sec. The car weighed with its load 3590 lb. and empty 2918 lb.

### New York and Chicago Show Plans Under Way

NEW YORK CITY, Sept. 20—Definite plans are well under way for the Sixteenth Annual National Automobile Show in New York next January, also the Sixteenth National Show in Chicago the same month. Application blanks and diagrams for these shows of 1916 have been sent by the National Automobile Chamber of Commerce to those manufacturers who have been invited to participate, with the announcement that those desiring space must apply not later than Oct. 2 to be considered in the first allotment, which will be made on Oct. 7. It is planned to stage the shows on an even greater scale than former efforts.

S. A. Miles, manager of the shows, has adopted a new rule this season which will afford protection against those companies that have been in the habit of applying for space in past years and then failing to exhibit. The new rule provides that applicants for space must make a deposit of 25 per cent on the value of the maximum quantity of space applied for. Under this plan companies will be protected against concerns which apply, doubtless with the intention of exhibiting, but which fail to comply with the contract requirements, thereby forcing other applicants into less desirable allotments and leading to confusion and changes which cannot always be made with perfect fairness. The change simply means that the deposit is payable 2 weeks earlier than it has been in the past.

### Bosch Prizes for Sheephead

NEW YORK CITY, Sept. 20—The Bosch Magneto Co. is offering the following prizes for the Sheephead Bay race on Oct. 2: First, \$500 in gold; second, \$300 in gold; third, \$200 in gold. In addition to the above prizes, there will be an additional bonus of \$100 for each place,

providing the winner makes a better average than the best time made in an American long distance contest, i.e., an average of 101.86 m.p.h., provided the second driver makes a better average than the best time made by a second place car, an average of 100.56 m.p.h., and provided the third driver makes a better average than 97.78 m.p.h. These drivers must employ Bosch magneto ignition during the entire race.

#### Denver Distributors Divided on Exhibiting at State Fair

DENVER, COL., Sept. 17—Denver distributors seem about equally divided regarding the value of State fair and county fair exhibits for aiding automobile sales. Some dealers are assisting their sub-dealers financially in making such exhibits, and are also placing a salesman at the disposal of the sub-dealer and furnishing a demonstrating car for use outside the fair ground, even when the fair is many miles from Denver. Other distributors claim that they do not see enough good in these fair exhibits to justify giving their sub-dealers any financial aid, but nevertheless they are willing to furnish a salesman as an encouragement to sub-dealers eager to place exhibits at their local fairs.

#### The Arguments

Those favoring the fair exhibits urge that these events afford an excellent opportunity to show cars and stimulate trade, even if direct orders are not noticeable. Those holding that there is no benefit in such exhibits argue that the farmer attends the fair solely for enjoyment, and while he may be interested in cars even to the extent of being a prospective buyer, he is more interested in the displays of farm products, livestock and implements, and particularly in having a good time.

Along with all this diversity of opinion regarding different features of the fair exhibit question, however, the dealers practically all agree that a large share of these fair "prospects" are very likely live prospects before the show is held and would become buyers soon without the need of any extra expense to arouse their interest through a fair exhibit. Also, the attitude taken by the distributors is largely in accordance with the policy outlined by their respective manufacturers.

#### Steenstrup Sails for S. A.

DETROIT, MICH., Sept. 18—Peter S. Steenstrup, South American representative for the Hupp Motor Car, Co. has sailed on an extensive business trip in the interest of the company. He will go to Panama, Peru, Chili, Argentina and Brazil and probably be away for three or four months.

## Races Feature of Spokane Fair

### Two Track Records for Local Drivers Broken — Over 10,000 in Attendance

SPOKANE, WASH., Sept. 17—The automobile races at the opening of the Spokane Interstate fair proved the big attraction, and upward of 10,000 were present.

Track records for local drivers twice went by the board when Harry Bohr headed the Plummer Special around the ½-mile dirt course making the 5 miles in 6:16 3/5 in the preliminary heat of the Inland Empire Class D race, and then drove the same car to victory in the finals of the same race in 6:09 2/5.

The 5-mile record for the track for local drivers has been 6:23, made by Herbert Alderson in 1911. The Plummer Special is a Stutz stock car.

Eleven cars entered the qualification test, a mile against time, four to qualify. In this test the Schneider Special of North Yakima (Kocher), the Parsons Special (Parsons), and the National (Mattison) turned in the three fastest miles in order. The Ford and Stutz Special tied for fourth place in 1:12. In the run-off the Stutz recorded a mile in 1:08 3/4, while the Ford could not equal its first time.

The Parsons, Schneider, National and Stutz entered the pursuit race, the cars being stationed 220 yd. apart at the four-eighth poles about the track. The Stutz was eliminated after a few laps, being challenged by Parsons. The National was unable to stand the pace. At the beginning of the eleventh lap Parsons held the lead, hotly pursued by the Schneider Special. At the thirteenth lap Parsons led by but 50 yd. and on the next Kocher cut this to about ten. On the twenty-fourth lap the Schneider car got its nose in front to the great delight of the crowd, but Kocher momentarily lost control of his steering gear, veering wildly, again giving Parsons the lead, but the plucky North Yakima lad came back strong and finished in the lead on the twenty-fifth.

Harry Hahn was a deeply disappointed lad when, 200 yd. in the lead in the Class D championship race, his engine froze, with the race half over and victory in sight.

#### Parsons and Stutz Duel

In the final race the Stutz Special had the pole with the National and Parsons Special and Schneider lining up as named. The Schneider was practically left with the fall of the starter's flag, Kocher having killed his engine. The early part of the race developed into a

brisk contest between the Parsons and the Stutz. Parsons tried twice to slip inside the white Stutz at the turn. At the sixteenth lap both cars lapped the National and a moment later the Stutz rocketed through the fence at the south end. Mechanician R. L. Williams suffered the fracture of his skull and Oral Palmer, driver, escaped unhurt. This Stutz is the old No. 8, driven by Cooper in 1913, with which he won the Montamarathon at Tacoma.

The Parsons car was out of commission shortly afterward with a broken connecting-rod and the 15-mile race settled down into an easy victory for Kocher in the Schneider, with McGoldrick, National, taking second. The time was 17:28.

McGoldrick drew down four seconds during the racing and \$280 in prize money. The 15-mile race was run at an average of 51.5 miles an hour. Two half miles were driven in 0.33.

Event No. 1—Qualifying heats for event No. 2, mile against time; flying start, four to qualify. Summary:

Car and Driver	Time	Fastest Lap
Schneider Spl. (Kocher).....	1:07 3/4	.33
Parsons Spl. (Parsons).....	1:08	.33
National (Mattison).....	1:10	.35
Ford (Hahn).....	1:12	.36
Stutz (Palmer).....	1:12	.36
Stutz Spl. (Bohr).....	1:13 1/4	.36 1/2
National Spl. (McGoldrick).....	1:14 1/4	.37
Lozier (Paulsen).....	1:16 2/5	.38
Oakland (Carlton).....	1:19 1/2	.39
Croton-Keeton (Penticoast).....	1:20	.40

In run off of the tie, National 1:08 3/4 fastest lap .33 3/4 Ford 1:12 1/4.

Event No. 2 Australian pursuit race: won by Schneider Spl. (E. Kocher), which lapped last rival, Parsons Spl., in 25th lap. No time.

Event No. 3, five miles, local cars: Preliminary heat won by Plummer Special (H. Bohr), National Spl. (Ed. McGoldrick) second, Lozier (Ray Paulsen) third. Time 6:16 3/5; Ford out fifth lap, oiling trouble.

Event No. 4, five miles, local cars: Won by Plummer Spl. (Harry Bohr), National Spl. (Ed. McGoldrick) second, Croton-Keeton (Penticoast) third. Time 6:09 2/5. McGoldrick's time 6:10 (breaks track record).

Event No. 5, five miles, qualifying heat, two fastest in finals won by Stutz (Palmer), National Spl. (Ed. McGoldrick) second, Plummer Spl. (Alderson) third. Time 6:57.

Event No. 6, free for all, fifteen miles: won by Schneider Spl. (E. Kocher), National Spl. (Ed. McGoldrick) second. Only these two finished. Stutz (Palmer) through fence. Parsons Spl. (Parsons) did not finish.

#### Farmers at Spokane Show

SPOKANE, WASH., Sept. 15—While the automobile dealers held a successful show in the Davenport Hotel, Spokane in May, they deemed it wise to avail themselves of the opportunity to show their 1916 models at the twenty-second annual Interstate fair Sept. 13 to 20. While fine results were obtained by the dealers from the spring show, the fall show at the fair grounds brought them into closer touch with the great majority of the farmers in the Inland Empire.

While but few cars were sold direct to the farmers, Spokane distributors have appointed many sub-agents recently and these new dealers were on hand to learn all they could of the new models, introduce their prospects to them, and many sales resulted.



# Factory Miscellany

**D'Arcy Spring Adds**—The D'Arcy Spring Co., Kalamazoo, Mich., manufacturer of automobile springs, will erect an addition to its plant.

**Kalamazoo Co. Builds**—Fuller & Son, Pitcher Street, Kalamazoo, Mich., are building a factory, four stories, 61 by 101 ft., for the manufacture of automobile parts.

**Automobile Hardware Co. to Build**—Crandal, Stone & Co., Binghamton, N. Y., manufacturers of automobile hardware, etc., have awarded contract for the erection of a four-story brick and steel factory, 40 by 100 ft., to cost about \$20,000.

**Colorado Tire's New Addition**—The Colorado Tire & Leather Co., 999 South Broadway, Denver, is planning a \$75,000 addition to its plant. The new building will have 25,000 sq. ft. of floor space, and will be equipped with a rubber mill.

**Hayes Wheel Adds**—In order to do away with night work the Hayes Wheel Co. in Albion, Mich., will put up an addition, 70 by 100 ft., to its plant which will enable it to increase its output about two-thirds. A total of 150 men will be employed.

**Merrill Spring to Add**—The E. R. Merrill Spring Co., 526 West Twenty-eighth Street, New York City, manufacturer of automobile and truck springs, is having plans prepared for alterations to two buildings and the erection of two other buildings.

**Vacuum Oil Adds**—The Vacuum Oil Co., Rochester, N. Y., will build another addition to the local plant. It will be a filter building and will cost \$17,000. This

will bring the company's expenditures for improvements this year up to \$210,000. It plans to spend \$500,000 in improvements in the next year.

**Hyatt to Build Warehouse**—The Hyatt Roller Bearing Co. will begin the erection of a large warehouse on the Michigan Central railroad, having decided to make Detroit, Mich., its distribution center, not only for the automobile end of the business but also for the tractor department. At the present time a carload of Hyatt bearings is received in Detroit daily, according to the officials of the company.

**Seattle Ford to Extend**—Extensions to the plant and equipment of the Ford Motor Co.'s assembling factory in Seattle are to be made within the next few months entailing the expenditure of approximately \$100,000. An average of thirty-two cars is being turned out each day. When the contemplated addition is finished the production will be between sixty and sixty-five machines a day.

**Winnipeg Ford Nearing Completion**—Provided that favorable conditions prevail the new Ford building in Winnipeg, Man., will have its roof on by Nov. 20. The excavating work is rapidly being completed and already the supplies for the construction operations are being received at the site, corner of Portage Avenue and Wall Street. Business at the local Ford establishment continues brisk. From Aug. 1 to Sept. 2 deliveries of 259 cars were made in Manitoba.

**To Make Starter**—The Rock-Way Starter Co., Jonesville, Mich., is the name of the new concern which will start

manufacturing the new starter invented by G. L. Rock, proprietor of the Jonesville Garage. With him there will be associated his brothers, Alonzo and Darrell, the latter having been at one time superintendent of the service department of the Cadillac Motor Car Co. It is said that local people are interested financially and will provide the capital.

**F. W. D. May Start Oct. 1**—The Four-Wheel Drive Truck Co., Battle Creek, Mich., which is to make the truck designed by Maurice Bollstrom, a pioneer in this type of vehicle, will very likely be ready to start operation by Oct. 1. An option has been secured on a local plant and the organization work is said to have progressed in such a way that actual manufacturing will be started in October. One type chassis of ½-ton capacity will be made and will be furnished with a dozen types of bodies, such as express wagon, ambulance, hearse wagon, ordinary truck, U. S. mail wagon, etc.

**Wayne Tank to Enlarge**—Work will be started in a short time on two new factory buildings for the Wayne Oil Tank & Pump Works of Fort Wayne. The cost of the improvement will be about \$40,000. The buildings will be constructed of steel and concrete and will be absolutely fireproof. A large amount of new machinery will be purchased for the buildings, which will be completed about the middle of December. The Wayne Oil Tank & Pump Works have been turning out more orders this year than ever before in their history, and the capacity of the present factory has been reached.

## The Automobile Calendar

Sept. 18-25.....Los Angeles, Cal., Show, Shrine Auditorium.  
Sept. 20-25.....San Francisco, Cal., International Engineering Congress.  
Sept. 22-25.....Rockford, Ill., Show.  
Sept. 24.....Indianapolis, Ind., S. A. E. First Section Meeting.  
Sept. 26-Oct. 10...Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.  
Sept. 27-Oct. 3....Salem, Ore., Show, State Fair.  
Oct.....Dallas, Texas, Show, Dallas Automobile Dealers' Assn.  
Oct. 18-25.....Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.  
Oct. 1-2.....Trenton, N. J., Track Races: Inter-State Fair.  
Oct. 2.....New York City, Sheepshead Bay Motor Speedway 350-Mile Race.  
Oct. 2.....Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.

Oct. 2-9.....Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.  
Oct. 4-10.....St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.  
Oct. 4, 5, 6.....Columbus, O., Garage Owners Convention.  
Oct. 4-14.....Wichita, Kan., Show, Wichita Auto. Dealers' Assn.  
Oct. 6-16.....New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.  
Oct. 9.....Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.  
Oct. 11-12.....Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.  
Oct. 14.....Chicago, S. A. E. Standards Committee Meeting.  
Oct. 16.....Chicago, Ill., 350-Mile Race, Chicago Speedway.  
Oct. 17.....Twin City Speedway Match Race.

Oct. 18-19.....Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.  
Oct. 18-24.....Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.  
Nov. 1-3.....Pasadena, Cal., Show, Hotel Green, Walter Hempel.  
Nov. 18.....Arizona 150-mile Grand Prix.  
Nov. 29-Dec. 4....Electric Prosperity Week.  
Dec. 31.....New York City, Show, Grand Central Palace.  
Jan. 8-15.....Philadelphia, Pa., Philadelphia Auto. Trade Assn.  
Jan. 22, 1916.....Chicago, Ill., Show, Coliseum.  
Jan. 24-29.....Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.  
Jan. 29-Feb.....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.  
Feb. 15-20.....Omaha, Neb., Show, Omaha Automobile Show Assn.  
Feb. 19.....Newark, N. J., Show.  
March 4-11.....Boston, Mass., Truck Show, Mechanics Bldg.

# The Week in the Industry



**Spalding St. Louis Packard Mgr.**—H. W. Spalding has been appointed general manager of the Missouri Packard Co., St. Louis, Mo.

**Bingham Promoted**—B. S. Bingham has been appointed assistant general sales manager for the Reliance Automobile Co., San Francisco.

**New Gotham Trailer Man**—C. H. Quereaux has succeeded F. H. Greaney as manager of the New York City branch of the Troy Wagon Works Co., maker of Troy trailers. The New York office is at 30 Church Street.

**Wells Moon's City Sales Mgr.**—P. H. Wells has been appointed city sales manager of the Moon Motor Car Co.'s St. Louis branch, 2227 Locust Street, while E. J. Moon is in the East. Mr. Wells has been with the Moon company seven years.

## Dealer

**Gibney Tire in Louisville**—The Dixie Auto Supply Co., 444 South Third Street, Louisville, Ky., has taken the agency for the Gibney tire.

**Recent Canadian Studebaker Appointments**—The Breen Motor Co. has appointed Clark & Cuthbert, Portage la Prairie; B. J. Thompson, Pense, Sask.; the Jackson Auto Agency, Saskatoon; U. R. Gordon, of Wilcox, Sask., and Morden & Graham, Pilot, as Studebaker agents.

**J. M. Shock Absorber Moves Office**—The main office of the J. M. Shock Absorber Co., 210 South Seventeenth Street, Philadelphia, Pa., has been moved to New York City to 250 West Fifty-first Street. The service station and sales office will be maintained at the original office in Philadelphia.

**St. Paul Maxwell Moves**—The Martin Motor Sales Co., distributor of Maxwell cars in the Twin Cities, has moved its St. Paul office from 344 North Exchange Street to the Kissel-Kar Building, 237 West Ninth Street, under the management of W. F. Frei. A service station will be opened.

**Recent Philadelphia Items**—The Standard Eight, the product of the Standard Steel Car Co., Pittsburgh, Pa., has been introduced in Philadelphia, Pa., the Eastern Motors Corp. being special representative. Showrooms have been opened at 1634 Chestnut Street.

The Allen car is represented in Philadelphia by the Allen Motor Philadelphia Co., 150 North Broad Street.

## Motor Men in New Roles

**Reynolds Heads St. Louis Goodyear Department**—The Goodyear Tire & Rubber Co., 1909 Locust Street, St. Louis, Mo., has inaugurated a mechanical-goods department. The department will be under the supervision of W. A. Reynolds.

**Elliott Cadillac Sales Mgr.**—R. S. Elliott, one of the veteran salesmen of the Don Lee organization in San Francisco and winner of the first prize for the number of Cadillac sales last season, has been made Cadillac sales manager for that territory.

**Mooney Joins Advertising Co.**—F. J. Mooney, formerly sales and advertising manager of the Hupp Motor Car Co., has joined the Taylor-Critchfield-Clague Co., Detroit, Mich., advertising agent, and will act as counsel in connection with automobile selling and copy plans.

**Wells Takes on Stearns in Des Moines**—H. R. Wells has taken on the Stearns Silent Knight for Des Moines, Iowa, and twenty-six Iowa counties. He will have headquarters here and is appointing many sub-agents. Business is opening up well for the Stearns car in Iowa, he states.

**Hohenphal Joins Simms**—E. H. Hohenphal has been appointed assistant sales manager and advertising manager of the Simms Magneto Co., East Orange, N. J. Mr. Hohenphal was formerly with the Bosch company and was manager of the automobile-supply department of Rubel & Co., Washington, D. C.

**Kesler a Manager**—S. W. Kesler, who recently resigned from the I. S. Remson Mfg. Co., Brooklyn, N. Y., Abbott-Detroit and Westcott dealer, to become affiliated with the Brooklyn branch of the Packard Motor Car Co., has been made manager of sales of a Brooklyn branch of the Kent Motors Co. His headquarters are at 1251 Bedford Avenue.

**Schneider Heads Elco Agency**—The Elco agency in the St. Louis district has been given by the Bimel Buggy Co., Sidney, Ohio, to the Motor Car Repair & Supply Co. at Missouri Avenue and Pestalozzi Street, St. Louis. This is the first time the Elco line has been sold in St. Louis. The local district includes eastern Missouri and southern Illinois. Officers of the local agency are Frank Schneider, president; Max Gapinski, manager, and William Hoag, secretary.

**Sharpe Russian Transportation Mgr.**—O. C. Sharpe, superintendent of the Stew-

art Taxi-Service Co., Baltimore, Md., is on his way to Russia, where he will have charge of the movement of the big American-built motor-truck fleet that the Czar's government has purchased for use in the war.

Mr. Sharpe's position will be that of transportation manager and it will be his duty to direct the movement of the cars and to see that repair stations are established and to also see that the machines are always in serviceable condition.

According to information Petrograd will be his base and he will have the handling and supervision of the drivers between the hospital and battle lines.

He started Sept. 15 for Montreal and will make his trip to Russia from Canada.

## Dealer

**To Make Tractors**—The Reed Foundry & Machine Co., Kalamazoo, Mich., is one of the latest entries into the field of tractor manufacturers. The company has completed the building of a tractor which was tried out on a farm near Richland. The tractor easily pulled four 14-in. plows through the heavy soil.

**De Kalb May Take McIntyre Plant**—The De Kalb Mfg. Co., with headquarters at Auburn, Ind., if the proper negotiations can be made, will take over the property of W. H. McIntyre, automobile manufacturer of Auburn. A new organization will be formed. The De Kalb company has been incorporated for \$150,000.

**Grossman Opens Chicago Branch**—The Emil Grossman Mfg. Co., Inc., New York City, has leased the top floor of the building formerly occupied by the Winton Motor Car Co., at the northeast corner of Michigan Avenue and Thirteenth Street, Chicago. Here will be located their western manufacturing and distributing branch. The space occupied is 6000 sq. ft. Rudolph Cory was appointed manager of the Chicago branch.

**Almond Branch in Detroit**—A branch office of the T. R. Almond Mfg. Co., Ashburnham, Mass., has been established at 1257 David Whitney Bldg., Detroit, from which point Don F. Kennedy, who has been appointed Michigan representative, will take care of its Michigan business which consists chiefly of flexible steel tubing for use on automobiles and trucks, and its line of drill chucks. Mr. Kennedy will also handle the business of the Sawyer Tool Mfg. Co., which is under the same management as the Almond Co., on its line of machinists' fine tools.



## Recent Incorporations in the Automobile Field

## Arkansas

LITTLE ROCK—Davenport Safety Tire Co.; \$100,000. J. R. Alexander, W. H. McLaughlin.

## Connecticut

STAMFORD—Motor Products Co.; \$100,000. Allen Sheldon, R. K. Green, P. D. Whitton, F. B. Bertram, Elliott Savage.

## Illinois

DANVILLE—Holmes Garage Co.; \$21,000. W. C. Holmes, D. W. Beckwith, B. N. Custer.

## Indiana

INDIANAPOLIS—Durnell Motor Sales Co.; \$10,000. C. E. Durnell, E. E. Voyles, C. F. Voyles.  
INDIANAPOLIS—Meridian Mfg. Co.; \$75,000; automobiles. Elmer Hinshaw, E. W. Hughey, H. M. Callahan.

## Maryland

FREDERICK—Mountain City Garage Co.; \$25,000. M. E. Kefauver, J. H. Grove, D. P. Buckey.

## New York City

NEW YORK CITY—Adams-Williams Mfg. Corp.; \$100,000; top manufacturer. V. J. Stahl, K. G. Osborn, F. G. Schwab, 323 W. Seventy-seventh Street.  
NEW YORK CITY—Bergen Carburetor Co.; \$2,000; manufacturer. M. E. Harby, 31 Nassau Street; William A. Watson, A. S. Bergen.  
NEW YORK CITY—Eastern Motor Sales Corp.; \$10,000. F. S. Hannah, A. G. Keinath, C. M. Fleming, 540 Manhattan Avenue.  
NEW YORK CITY—E. H. & F. Co.; \$100,000; motor manufacturer. F. C. Royce, W. N. Frazer, T. F. Hyatt, 1169 Eighty-third Street, Brooklyn.  
NEW YORK CITY—Empire State Sight-Seeing & Trucking Co.; \$1,000; trucking and sight-seeing. C. F. Fuchs, Rudolph Pick, Walter Latzer, 989 Simpson Street.  
NEW YORK CITY—Lewis Roller Bearing Co.; \$10,000; manufacturer. Emil Auerbach, S. B. Levy, I. A. Cohen, 39 W. Thirty-fourth Street.  
NEW YORK CITY—Lombard Auto Tractor-Truck Corp.; \$25,000; manufacturer. J. S. Barron, 320 W. Seventy-seventh Street; J. T. Crowley, R. O. Eggleston.  
NEW YORK CITY—Perfect Service Taxicab Co.; \$500. A. H. Schweizer, R. G. Schweizer, Sam Klein.  
NEW YORK CITY—Peugeot Automobile Racing Co.; \$500. Leon Mintz, A. J. Hill, William Thierfelder, 433 E. Fifth Street.  
NEW YORK CITY—Pullman Motor Car Co. Export Dept.; \$10,000. J. C. Cameron, Albert Frankel, C. A. Doyle, 132 Ash Street, Flushing.  
NEW YORK CITY—P. E. Remington; \$500,000; automobile business. P. E. Remington, N. M. Kaplan, T. P. Wadleigh, 1790 Broadway.  
NEW YORK CITY—Safety Steering Device Co.; \$15,000. H. C. Miller, L. H. Tasker, Charles Blauvelt, 232 Broadway.  
NEW YORK CITY—Standard Auto-Bus Corp.; \$3,000. William Goldsmith, Louis Muschel, William Muschel, 519 W. 150th Street.

NEW YORK CITY—Standard Truck Corp. of N. Y.; \$10,000. Florence Boldman, E. D. Boldman, H. W. Johnson.

NEW YORK CITY—Sterling Automobile Mfg. Co.; \$100,000; manufacturer. Charles Chambers, 2 Rector Street; William Adelson, Adolph Hayman.

NEW YORK CITY—St. Paul Garage; \$10,000. C. J. Brennan, J. J. Duffy, A. F. Moons.

## New York

BROOKLYN—Bell Rubber Co.; \$20,000; tires. W. O. Gelsman, Anna Gelsman, S. F. Schroeder.  
BROOKLYN—Liberty Garage; \$15,000. George Way, Fred. Smith, A. A. Russell.  
BROOKLYN—J. J. Snyder & Son; \$50,000; garage. J. J. Snyder, L. R. Snyder, P. A. Snyder.  
BROOKLYN—Surplus Motor Parts Co.; \$1,000; automobile machinery. S. S. Waldman, Harold Obst, Joseph Sokoloff.  
BROOKLYN—Windsor Mahnd Co.; \$10,000; garage. A. G. Welsh, William Gegenheimer, R. C. Corlett, 1500 E. Third Street.  
BRONX—Intervale Garage and Auto Service; \$5,000. A. B. Goodwin, F. J. Goodwin, A. J. Goodwin.  
BRONX—Sundries Co.; \$5,000. Charles Weisshaupt, Hugo Liedtke, E. P. Butler, 533 Union Avenue.  
BRONX—Unedea Garage; \$1,000. Pauline Feiner, N. E. Harcombe, S. B. Steinmetz.  
BUFFALO—Nicholson & Stoll; \$1,800; garage. Lance Nicholson, Amy Nicholson, Thomas Stoll.  
BUFFALO—Transmission Ball Bearing Co.; \$100,000; manufacturer. W. J. Murray, J. P. Beatty, W. M. Wilson, 35 Pearl Street.  
ELMIRA—Interstate Pneumatic Valve Corp.; \$5,000; manufacturer. C. H. Thayer, Fred Peck, H. B. Peck, 131 Cedar Street.  
GLEN COVE—Pressed Bearing Co.; \$3,000; bearing, tools, etc. Mortimer Schwager, F. S. King, A. M. Schmidt, 556 McDonough Street, Brooklyn.  
HEMPSTEAD—Great Neck Garage & Repair Co.; \$2,000. Henry Allendorf, F. L. Place, Erwin Giesman.  
HUDSON FALLS—Adirondack Garage Co.; \$50,000. F. C. Sherman, E. V. Bulow, G. N. Nay.  
LAKE PLACID—McElroy-Prime Motor Co.; \$50,000. J. H. McElroy, S. G. Prime, P. J. Hennessey.  
OSSING—Simplex Rubber Co. of America; \$300,000; rubber goods of all kinds. N. A. Campbell, 31 Pine Street, New York City; E. Gwynne-Evans, A. C. Travis.  
RICHMOND BOROUGH—Pegasus Garage Corp.; \$3,000. C. P. Siemers, Arthur Wood, L. E. Manning.  
SYRACUSE—Auto Supply and Tire Co.; \$2,000. F. A. Samon, S. G. Schlachter, A. A. Schlachter.

## Ohio

AKRON—McCrea Auto Service and Supply Co.; \$5,000. George McCrea, E. A. McCrea, G. E. McCrea, R. T. Walsh, L. J. Myers.  
CANTON—Auto Garage and Sales Co.; \$10,000. J. M. Roese, E. C. Scheffler, F. N. Switzer, G. E. Halliwell, A. M. Hurst, H. J. Reeder.  
CINCINNATI—Struebing Truck Co.; \$5,000. W. J. Struebing and others.  
CLEVELAND—Hudson-Stuyvesant Motor Co.; \$25,000 to \$50,000.  
OTTAWA—Auto Products Co.; \$250,000; automobiles. R. D. Bray, W. J. Halpin, P. J. Daly.

CLEVELAND—Victor Motor Car Co.; \$12,000. A. F. Reed, C. M. White, V. C. Snyder, J. M. Lee, R. B. Curtiss.

DAYTON—Two-In-One Tire Co.; \$10,000. George Inman, D. W. Marsh, T. J. Curran, W. B. Schaeffer, A. P. Smith.

RAVENNA—Mohawk Motor Truck Co.; \$25,000. H. C. Bradley, E. J. Smith.

ST. CLAIRSVILLE—St. Clairsville Garage Co.; \$5,000. J. E. Anderson, E. A. Caldwell, W. H. Caldwell, T. J. McNamee, Otto Rothmeier.

TOLEDO—Universal Motor Co.; \$100,000. Howard Lewis, H. J. Keho, F. S. Lewis, H. Emery, P. W. Alexander, Frederick Gaines.

XENIA—Xenia Garage Co.; \$2,500. J. B. Bice, F. Bice, C. W. Craig, M. H. Schmidt and Mrs. M. H. Schmidt.

## Pennsylvania

HAZLETON—Power City Motor Car Co.; \$5,000. H. M. Benjamin, W. C. M. Butler, C. J. Kirchman.

PHILADELPHIA—Speedwell Motor Service Co.; \$5,000. W. P. Veas, F. W. Veas, S. K. Cissel.

SHAMOKIN—Stief Motor Co.; \$10,000. M. C. Stief, J. W. Timmes, M. L. Conneon.

## South Carolina

GAFFNEY—Gaffney Motor Co.; \$5,000. E. M. Dupre, C. S. Monteith.

## Texas

DALLAS—Dallas Hupmobile Co.; \$5,000. F. A. Wynne, W. R. Wynne, E. O. Thackston.

SAN ANTONIO—Blumberg Motor Mfg. Co.; \$25,000. H. G. Blumberg, H. D. Hierholzer, Joseph Hierholzer, Robert Butler.

## Virginia

ASHLAND—Hanover Garage and Repair Co.; \$10,000. Boxley Vaughan, F. W. Tucker.

GALAX—Twin County Auto Sales Corp.; \$20,000. J. G. Davis, C. A. Collier.

## Washington

SEATTLE—Jaquemin Auto Steel Wire Tire Co.; \$100,000. Evan Gough, Eugene Jaquemin, J. R. Cabanne, H. M. Hill.

SEATTLE—Seattle Tire & Rubber Co.; \$2,500. Arthur W. Hoppock, Harry H. Hazeltine and Mary C. Hoppock.

SEATTLE—The Washington Garage; \$10,000. Walter T. Douglas, N. E. Felt, E. H. Sennott.

SPOKANE—Northwest Auto Supply Co.; \$5,000. Maurice Oppenheimer, Charles D. Bibbins.

SPOKANE—Washington Motor Car Finance Co.; \$250,000. C. A. Plackett, M. L. Moe, Edw. V. Carter.

## West Virginia

PARKERSBURG—Central Garage Co.; \$5,000. O. D. Strader, H. D. Little, H. N. Kinler.

## Wisconsin

CEDAARBURG—Automatic Jack Co.; \$25,000. J. R. Thill, E. J. Groth, M. N. Green.

## In the Dealers' Field

**New Duluth Garage**—Formal opening has been made of the new John E. Ford garage and service station at 208 East Superior Street, Duluth. Mr. Ford will have a service station night and day for owners of Chevrolet and Winton cars and others. He represents the Firestone tire and will give service in that line in the second floor shop. The show and sales rooms occupy the ground floor.

**Recent Seattle Changes**—J. C. C. Morris, distributor of Moon automobiles in the Pacific Northwest has moved into new quarters at 907 East Pike Street, Seattle. G. G. Gunderson has been named city sales manager.

**Pacific Auto Supply Co.**, Seattle, has enlarged its quarters at 801-3 Union Street. This concern is distributor for Waverly motor oils, Knight and Ajax tires.

**Winnipeg Cadillac Moves**—The Winnipeg, Man., branch of the Cadillac Motor Sales Co. will move at the beginning of

October to the large building at 310 Carleton Street, which was formerly occupied by the Detroit Electric Service Station. In its new quarters it will have three floors at its disposal and practically three times the amount of room which is available in its present building. Both the Cadillac and Dodge cars will be handled from the new quarters.

**New Tire Agencies in Wash.**—The Child, Day & Churchill Co., Spokane, has secured the agency for the Norwalk tires in the Inland Empire territory.

The W. J. Ball Motors Co., Spokane, has moved into its new garage at 1116-18 Sprague Avenue, where it handles the Studebaker. Ajax tires will also be handled.

Kelly-Springfield tires are now being distributed in Tacoma by the Griffith Motor Company, which has put the Dodge car to the front in Southwest Washington.

**New Automobile Row for Portland**—

Portland, Ore., has now practically a new automobile row at what is known as the Custom-house corner. The Oregon Motor Car Co., Studebaker representative, and the Pacific Kissel-Kar branch have announced the construction of two new homes near the Custom House corner on lower Broadway.

Recently the Overland distributor, J. W. Leavitt & Co., settled in a new home directly south of the Custom House, and the Fisk Rubber Co. of New York is completing a building on the southeast corner. Just one block north, at Couch and Broadway, the Oldsmobile has opened handsome new quarters. This gives a total of five automobile concerns in this new center.

Among the pioneer firms already located along Broadway are the H. L. Keats Co., the Northwest Auto Co., the wholesale accessory house of Ballou & Wright, the White Co., and the B. F. Goodrich Co.

